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Did Doubling Reserve Requirements Cause the Recession of 1937-1938?

A Microeconomic Approach

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Abstract

In 1936-37, the Federal Reserve doubled the reserve requirements imposed on member banks. Ever since, the question of whether the doubling of reserve requirements increased reserve demand and produced a contraction of money and credit, and thereby helped to cause the recession of 1937-1938, has been a matter of controversy. Using microeconomic data to gauge the fundamental reserve demands of Fed member banks, we find that despite being doubled, reserve requirements were not binding on bank reserve demand in 1936 and 1937, and therefore could not have produced a significant contraction in the money multiplier. To the extent that increases in reserve demand occurred from 1935 to 1937, they reflected fundamental changes in the determinants of reserve demand and not changes in reserve requirements.

JEL codes: E51, E58, G21, G28, N12, N22
keywords: reserve requirements, reserve demand, excess reserves, money multiplier

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I. Introduction

Today, U.S. banks hold roughly a trillion dollars in excess reserves. The potential for those excess reserves to fuel a future expansion of money and credit, and possibly an acceleration of inflation, is a concern being voiced by many observers who are encouraging the Federal Reserve (Fed) to be ready to respond to such an expansion. This policy question today is closely related to monetary policy actions by the Fed in the 1930s. In 1936 and early 1937, in response to high levels of excess reserves, the Federal Reserve doubled the minimum reserve balances that member banks were required to hold with the Fed as a proportion of their deposits. In May 1937, a recession began. As a result, many commentators (most notably, Friedman and Schwartz, 1963) since that time have linked the onset of the recession to a tightening of monetary policy, of which the doubling of reserve requirements was a major component. Friedman and Schwartz contend that the increase in reserve requirements caused banks' reserve demands to rise, reducing the amount of deposits and credit that could be built upon the existing monetary base.

Although widely accepted, the Friedman and Schwartz (1963) view of the origins of the recession of 1937-1938 has been challenged. Other policies – tax rate increases in 1936 (Romer 1992, Calomiris and Hubbard 1995) and the sterilization of gold inflows beginning in December 1936 – also preceded the recession of 1937-1938, and have been recognized as important contributors to the economic contraction. Some authors – notably Hanes (2006) – argue on the basis of time series analysis that the changes in reserve requirements had no discernible effect on bond yields. Nonetheless, the Friedman and Schwartz (1963) interpretation remains widely accepted among economists, policymakers, and textbook authors (e.g., Romer, 1992, 2009; Mishkin, 1989, pp. 399-400).

In this paper, we take a microeconomic approach to gauging the effects of doubling reserve requirements in 1936-1937, and in particular whether they represented a tightening of monetary policy and thereby were a likely cause of the recession of 1937-1938. If the increase in reserve requirements reduced the supplies of credit and money, they would have done so by increasing the demand of Fed member banks for reserves. We estimate the demand of Fed member banks for reserves during this period to gauge whether the increase in reserve requirements increased reserve demand, and through that increase, caused a reduction in the supplies of credit and money. We find that reserve requirements were not binding on bank reserve demand, and thus the increase in reserve requirements had little if any effect on the money multiplier and the supplies of money and credit.

Section II provides a review of the literature. Section III lays out the theoretical basis for our empirical approach. Section IV describes the paths of required, excess, and total reserves, by bank type and location, for various reserve concepts. Section V describes our microeconomic data. Section VI presents our estimation results for reserve demand in the absence of increases in reserve requirements. Section VII uses those estimates to simulate the level of reserves held by banks in the absence of any reserve requirement increases in 1936 and 1937, and shows that there is no residual amount of increased reserve demand attributable to the increases in reserve requirements. Section VIII concludes by considering the implications of our findings for monetary policy today, given the high levels of excess reserves currently in the banking system.

II. Literature Review

The Banking Act of 1935 expanded the Federal Reserve's authority to set the reserve requirements imposed on the System's member banks. The Fed subsequently doubled requirements to their legal maximum rates in three steps in August 1936, March 1937, and May 1937 (see Table 1). The Fed took this action primarily in response to a rapid and large increase in reserve balances in excess of legal requirements, which Fed officials viewed as posing a potential inflation threat that could derail the economic recovery. A second consideration was a desire by Fed officials to regain control of monetary policy from the Treasury and to make the Fed's traditional policy tools—the discount rate and open-market operations—relevant and effective. The Fed viewed the significant slack in excess reserves as undermining the effectiveness of its other tools (See Friedman and Schwartz, 1963, pp. 520-22; Meltzer, 2003, pp. 495-500). Finally, the use of the reserve requirement as a policy tool reflected the loss of control by the Fed over the monetary base after 1935. The newly created monetary powers of the Treasury (the Exchange Stabilization Fund and the power to set the price of gold and thereby determine the size of gold inflows, established in 1934 and 1933, respectively) gave the Treasury effective control over the supply of high-powered money. The capacity of the Treasury to increase the monetary base was greater than the capacity of the Fed to reduce it, and Secretary Morgenthau recognized and used that strategic advantage to exert control over the Fed's monetary policy (Calomiris and Wheelock 1998; Meltzer 2003; Calomiris 2010). The Fed engaged in almost no open-market operations over the period 1935-1941. The power to set reserve requirements, and thereby potentially to influence the money multiplier, however, remained with the Fed.

Fed officials did not view the increases in reserve requirement in 1936 and 1937 as a tightening of monetary policy. Rather, they viewed excess reserves as "superfluous" balances, and expected that the increases in reserve requirements would have little or no impact on interest rates or credit supply (Meltzer, 2003, pp. 495-96). Their goal was not to tighten monetary conditions, but to put the Fed into a position to either tighten or ease policy later using open-market operations and changes in the discount rate. By contrast, Friedman and Schwartz (1963) contend that the increases in reserve requirements substantially reduced money stock growth and were a main cause of the recession of 1937-38, and their view has remained widely accepted.

Friedman and Schwartz (1963) argue that the hikes in reserve requirements were contractionary because they increased the demand for reserves relative to deposits, and thereby reduced the money multiplier. The familiar Friedman-Schwartz monetary decomposition defines the money stock (M) as a function of the monetary base ("high-powered money") and a multiplier determined by the public's relative holdings of currency and bank deposits (C/D), and the ratio of bank reserves to deposits (R/D). Total bank reserves, in turn, can be written as the sum of required reserves (RR) and reserves held in excess of legal requirements (ER). Hence,

(1) $$M = D + C$$

(2) $$\text{Base} = R + C$$

(3) $$M = (\text{Base}) \times [(1 + C/D) / (RR/D + ER/D + C/D)].$$

Thus, the money stock (M) is *mechanically* related to reserve requirements, which determine the ratio RR/D; hence, *all else equal*, an increase in reserve requirements will reduce the money stock.

From the perspective of this calculation, the key issue is whether the ratio of excess reserves to deposits is sensitive to a change in reserve requirements. If the demand for total reserves (for managing portfolio risk and liquidity risk) is sufficiently high (see, for example, Calomiris and Wilson 2004), then even a large increase in a non-binding reserve requirement will have no effect on the demand for total reserves. In that case, a change in required reserves will have no effect on the money multiplier.

Friedman and Schwartz (1963) contend that the three increases in reserve requirements in 1936-37 produced a decline in the money stock that, in turn, caused the recession of 1937-38. Figure 1 plots the level of the money stock, the monetary base, and the ratios of bank deposits to reserves and bank deposits to currency. The months in which the three increases in reserve requirements took effect are indicated by vertical lines.

The money stock rose steadily between 1934 and early 1937. According to Friedman and Schwartz (1970, p. 30), total deposits reached its peak in March 1937. Mechanically, the primary drivers of money stock growth were a growing monetary base, caused mainly by a growing monetary gold stock, and a rising ratio of bank deposits to currency, i.e., inverse of C/D. By contrast, the ratio of deposits to reserves, i.e., the inverse of R/D, generally fell and, all else equal, would have caused the money stock to fall. The ratio of deposits to reserves continued to fall after the first increase in reserve requirements in August 1936 through December of that year. According to Friedman and Schwartz (1963, p. 526), "[T]he increase in reserve requirements did have important current effects. … [F]rom the end of July to the end of December 1936, the ratio of deposits to bank reserves declined sharply as banks sought to restore their excess reserve positions. In consequence, although high-powered money grew by decidedly more in those five months than in the prior seven months, the stock of money grew by less than half as much."

Friedman and Schwartz (1963, p. 804) measure monthly changes in the ratio of deposits to reserves, which was generally declining throughout the second half of the 1930s. The ratio of deposits to reserves reached a peak in June 1936, regaining its March 1935 level after having fallen to a local minimum in January 1936. It then declined from June to November 1936, and remained fairly stable from October 1936 until November 1937 (varying between 4.93 and 5.12), and was nearly constant (varying between 4.96 and 4.98) during March through June 1937.The ratio of deposits to reserves changed little immediately following the increases in reserve requirements in March and May, 1937 and, in fact, *rose* from 4.96 in May 1937 to 5.12 in August 1937. Beginning in August 1937, the ratio began to fall once more. Thus, the three increases in reserve requirements occurred during a period in which the aggregate ratio of deposits to reserves had already been declining and the changes in reserve requirements had no clear short-run impact on the ratio of deposits to reserves. It is not obvious from any simple analysis of the aggregate data, therefore, that the doubling of reserve requirements caused the ratio of deposits to reserves to fall more than it would have otherwise.

The significance of doubling reserve requirements in 1936-37 remains an unsettled question. According to Friedman and Schwartz (1963), banks built up substantial reserve balances in excess of legal requirements during the Depression as a precaution against bank runs. After 1933, gold inflows caused the monetary base to rise, which, according to Friedman and Schwartz (1963), enabled banks to satisfy their increased precautionary demand for liquid assets.[1] Friedman and Schwartz (1963) argue that the increases in reserve requirements in 1936-37 raised the demand for high-powered money because they reduced the amount of reserve balances that were available to satisfy a conversion of bank deposits into cash.

A number of economists have sided with Friedman and Schwartz (1963) and concluded that the hikes slowed the growth of the money stock and contributed to the recession of 1937-38. Chandler (1971), for example, concludes that the August 1936 increase "had no visible effect on monetary and credit conditions," but that the subsequent hikes were "a mistake." According to Chandler (1971, p. 316), Fed officials believed that the increases in reserve requirements would not induce banks to curtail their lending or sell securities, or cause interest rates to rise, but "Their forecasts were wrong…. They underestimated member bank demands for excess reserves as a source of liquidity." Chandler (1971) concludes that the recession of 1937-38 probably would have occurred in the absence of the increases in reserve requirements, and that the increases alone probably would not have caused a recession, but that the increases did contribute to the decline in economic activity.

Meltzer (2003, p. 503) agrees with Chandler's view that the increase in reserve requirements in August 1936 "had no perceptible effect on the economy in 1936." However, he notes that as a result of the hike, the *effective* monetary base was 10 percent lower in the second half of 1936 than a year earlier

[1] Morrison (1966) offers a similar interpretation of the accumulation of excess reserves during the 1930s.

and that the three hikes in reserve requirements locked up $3.1 billion of reserves that could have been used as the basis for money creation (p. 504, 518).

Frost (1971) suggests a different interpretation than Friedman and Schwartz (1963) for the accumulation of excess reserves during the 1930s. Frost (1971) contends that the large accumulation of excess reserves in the 1930s reflected movement along a stable demand curve rather than shifts in demand associated with banking panics or changes in reserve requirements. Banks held large amounts of excess reserves, Frost (1971) argues, because at the very low interest rates that prevailed in the 1930s, the cost of adjusting reserve positions exceeded the marginal interest earned on other short-term assets.

Wilcox (1984) provides some empirical support for Frost's (1971) hypothesis. Based on a three-variable VAR model of bank loan volume, investments and excess reserves, Wilcox (1984) finds that financial shocks explain only 1 percent of the variation in excess reserves during the Depression, whereas the decline in interest rates can account for 80 percent. Further, Wilcox finds that changes in reserve requirements had only small and statistically insignificant impacts on bank loans and investments, which he contends supports Tobin's (1966) claim that "raising reserve requirements may have been a mistake but it was probably a relatively harmless one."[2]

Cargill and Mayer (2006) investigate the impact of the increases in reserve requirements in 1936-37 by comparing changes in reserve and loan ratios of Federal Reserve member banks and nonmember banks following changes in reserve requirements (which applied only to Fed member banks). Non-member banks accounted for a small share of total bank assets in the mid-1930s. As of June

[2] Calomiris and Wilson (2004) show that, for New York City banks, increases in reserves during the mid-1930s reflected banks' desires to reduce their portfolio risk in response to losses of bank capital. They argue that contrary to Friedman and Schwartz, increased reserve demand did not reflect growing risk aversion of banks in response to the banking panics of 1931-1933, but rather, loan losses that reduced capital. Mounts, Sowell and Saxena (2000) and Lindley, Sowell and Mounts (2001) argue that the accumulation of excess reserves reflected high inventory-adjustment costs, rather than increased demand associated with banking panics.

1936, total assets of member and non-member banks was \$53.6 billion, of which \$46.5 billion was held in Fed member banks. Cargill and Mayer (2006) find that increases in reserve requirements were followed by increases in the reserves/assets ratios of member banks relative to those of nonmember banks, and decreases in the loans/assets ratios of member banks relative to those of nonmember banks. The authors conclude, therefore, that the increases in reserve requirements reduced credit supply and thereby likely contributed to the decline in economic activity during 1937-38.

One potential problem with the Cargill and Mayer (2006) interpretation is that it implicitly assumes that member and non-member banks had similar intrinsic reserve demands, once one controls for the effects of reserve requirements on Fed member banks. That assumption is unlikely to be true. Non-member banks were much smaller than member banks, on average. After 1934, in the presence of federal deposit insurance, that size difference should have been an important source of difference in reserve demand. Small banks tended to have small depositors, and since only deposits of under \$5,000 were covered by deposit insurance, the effective protection offered by deposit insurance varied greatly with bank size (Calomiris and White 1994, Calomiris and Wilson 2004). For example, if fundamental changes increased the reserve demand associated with uninsured deposits (to mitigate increased portfolio risk or depositor liquidity risk), banks that enjoyed deposit insurance protection on all or most of their deposits may not have felt as great a need to increase their reserves. Thus, the lesser increase in reserve ratios observed by Cargill and Mayer (2006) for non-member banks may simply indicate that non-member banks' fundamental demand for reserves (irrespective of reserve requirements) was less sensitive to changes in portfolio risk or liquidity risk. As we show in Figure 4 below, like non-member banks, Fed member banks that were located outside of major cities did not exhibit a rise in reserve demand from June 1936 to June 1937.

Hanes (2006) investigates the behavior of the yields on longer-term Treasury securities during the 1930s to determine how bond yields are influenced by changes in the supply of reserves in an environment where the overnight interest rate is effectively at the zero lower bound. Hanes (2006) presents a model of reserve demand in which the quantity of reserves demanded by a bank is determined by its required minimum balance, the overnight interest rate, the cost of a reserve deficiency and the degree of uncertainty about payment flows. The overnight interest rate falls to zero when the supply of free reserves (i.e., excess less borrowed reserves) is sufficiently large to ensure that a bank will always meet its reserve requirement. Hanes argues that this, in fact, was the case in the mid-1930s due to the large amount of excess reserves held by banks throughout the period. In that case, changes in required minimum reserve balances have no impact on reserve demand (and neither do changes in the discount rate or regulations affecting the cost of reserve deficiencies). However, bond prices must rise (and yields fall) to induce banks to hold any additional increases in reserve supply, even if the overnight rate is zero. Hanes estimates various regressions of weekly changes in bond yields on various measures of reserve supply and changes in reserve requirements for April 1934-August 1939. Whereas he finds that yields fell in response to increases in total reserves, Hanes (2006) finds that the impact of changes in *required* reserves was insignificantly different from zero. That finding suggests that reserve requirements may not have been a binding constraint on reserve demand for most banks.

One challenge to identifying the effects of the increases in reserve requirements in 1936-37 is that they coincided with another monetary policy action—the sterilization of gold inflows which began in December 1936 and continued until July 1937. Gold inflows, reflecting political and economic disruptions in Europe and Asia, were the principal cause of the rapid growth in bank reserves and the monetary base during 1934-36. Treasury officials grew increasingly concerned that gold inflows were fueling financial speculation and left the United States vulnerable to a sudden gold outflow (Meltzer, 2003, p. 504). In December 1936, President Roosevelt approved the Treasury's plan to sterilize further inflows, thereby preventing them from increasing aggregate bank reserves.

Between December 1936 and July 1937, the Treasury sterilized some $1.3 billion of gold inflows and total member bank reserve balances rose by just $180 million (Meltzer, 2003, p. 506). The resulting decline in the growth of the monetary base is apparent in Figure 1. Hanes' (2006) evidence suggests that the gold sterilization program, and the resulting decline in monetary base growth, was a more important cause of higher bond yields and the slowing of economic activity in 1937-38 than the hikes in reserve requirements. Friedman and Schwartz (1963, p. 510, p. 544) also conclude that the sterilization program "sharply reinforced" and "was no less important" than the hikes in reserve requirements in reducing growth of the money stock and causing the recession of 1937-38.

Hanes (2006) relies on regression identification to measure the effect of the reserve requirement changes by examining the significance of time series residuals for a small number of observations. Another way to approach identification, which has the benefit of relying on a larger number of observations, is to focus on the microeconomics of individual bank reserve demand. If changes in reserve requirements affected the supply of money and credit, it would have been by increasing the demand for reserves at Fed member banks (the ratio of reserves to deposits). Our empirical strategy is to disaggregate reserve demand and examine the behavior of individual banks and groups of banks to determine whether and by how much the reserve requirement increases raised the demand for reserves.

III. Theory and Empirical Methodology

Our empirical approach disaggregates the reserve holdings of the banking system to estimate reserve demand at the individual bank level, using call report data on Fed member banks for 1934 and 1935. Our empirical model allows reserve demand to vary with a variety of bank-specific characteristics.

We then simulate changes in reserve holdings of member banks for 1936-38 to address a counterfactual question: Did the level of total reserves held after 1935 vary as one would expect on the basis of the estimated model of reserve demand, under the counterfactual assumption of no change in reserve requirements? If the observed changes in the reserve holdings of member banks varied as one would expect on the basis of fundamentals, unrelated to changes in reserve requirements, that would suggest that the changes in reserve requirements had little or no effect on the demand for reserves.

More formally, we assume that reserve demand takes the form:

$$(4) \qquad (R/A)\text{ demand} = \text{Max} \begin{cases} (R/A)\text{ unrestricted} = \Phi(\text{fundamental characteristics}) \\ \\ (rrD/A) + \epsilon(\text{fundamental characteristics}) \end{cases}$$

In Equation (4) we express reserve requirements as rrD, where rr is the average reserve requirement against a representative mix of deposits. We express reserve demand as the ratio of reserves to assets, although in our empirical work we will also consider reserves expressed as a ratio of deposits. Reserves can be defined using alternative measures of reserve assets, some defined narrowly and some more broadly to include non-cash liquid assets, and we will consider various definitions of reserves in our empirical work. Fundamental characteristics that affect reserve demand include various characteristics of the bank and the market environment that affect a bank's decision about the proportion of assets to hold in liquid form. These include various influences on the riskiness of loans, withdrawal risks on various classes of deposits, and the costs of raising equity capital, which is an alternative way of reducing risk of default on deposits (see Calomiris and Wilson 2004).

According to Equation (4), and as imagined by Friedman and Schwartz, reserve requirements can be a binding constraint on reserve demand if the sum of required reserves and an exogenous amount of excess reserves demanded (for simplicity, in the aggregate, assume a constant buffer to ensure compliance with the requirement) is larger than the amount of reserves that would have been demanded in the absence of reserve requirements. An increase in rr that makes [(rrD/A) + Є] binding on reserve demand, therefore, will have a contractionary effect on the money multiplier. On the other hand, if [(rrD/A) + Є] is always less than Φ, because the amount of reserves desired for fundamental reasons unrelated to reserve requirements is relatively large, then changes in reserve requirements have no effect on (R/A) and no effect on the money multiplier or the money supply.

Our main empirical strategy is to estimate Φ using bank-level data for 1935 and use those estimates to simulate the path of (R/A) for 1936-1938. We then compare simulated reserves, actual reserves, and required reserves over that time period. To the extent that actual reserves track simulated reserves (based on a model of fundamentals) and are unrelated to changes in required reserves in 1936-1937, that would indicate little role for changes in reserve requirements in causing variation in actual reserves. If, instead, actual reserves deviated from simulated reserves and tracked changes in required reserves, that would suggest a potential role for changes in reserve requirements in driving reserve demand.

Three fortuitous aspects of the period 1934-1937 are noteworthy from the standpoint of our use of regression results based on December 1934 and December 1935 data to simulate counterfactual reserve demand for June 1936 - June 1937. First, interest rates were quite stable throughout the period December 1935-June 1937. That is fortuitous because interest rates capture an opportunity cost to holding cash reserves, and thus changes in interest rates could affect reserve demand. The Federal Reserve Board index of Treasury bond yields (Board of Governors 1976, pp. 469-71) reports the following yields for the key call report dates used in this study: December 1935: 2.83 percent; June 1936: 2.66 percent; June 1937: 2.76 percent.

Second, the period December 1935-June 1937 was one of stable economic and financial conditions. Reserve demand can increase during times of heightened macroeconomic risk, but economic growth was stable during this period and almost no banks failed.

Third, there were few new entrants into banking during this period. New entrants will tend to exhibit higher initial reserve demand, as it takes time for them to develop lending relationships with customers. A period of substantial bank entry, therefore, could exhibit significant shifts in reserve demand. That potential problem, however, is not relevant during the period 1934-1937. The number of country banks that were Fed members was 5,999 in December 1935, and 5,970 in June 1937. The number of central reserve city banks in New York City and Chicago was 52 in December 1935 and 50 in June 1937. The number of reserve city banks was 336 in December 1935 and 337 in June 1937.

Before performing a regression analysis and simulation to compare actual and counterfactual reserve holdings in 1936 and 1937 to see whether increases in reserve requirements affected reserve demand, we first describe the path of actual, required, and excess reserves during the mid-1930s, using various alternative definitions of reserves (which exclude or include various components). These comparisons offer useful preliminary insights from the perspective of Equation (4) about the extent to which required reserves were a binding constraint on total reserve demand in 1936 and 1937.

IV. Bank Reserve Measures Disaggregated By Type and Location of Bank

As specified by the Banking Act of 1935, Federal Reserve member banks were required to hold balances with Federal Reserve Banks to satisfy their legal reserve requirements. Vault cash and other liquid assets could not be used to satisfy minimum reserve requirements.[3] Nonetheless, banks did hold substantial liquid assets as "secondary" reserves to meet unexpected payments flows and investment opportunities, including not only vault cash, but also Treasury securities and other liquid assets.

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[3] Significant statutory changes to reserve requirements were last made under the Monetary Control Act of 1980. Since then, banks have been able to use vault cash to satisfy their legal reserve requirements.

Moreover, most banks maintained correspondent balances with banks in other cities, especially in central reserve city banks in New York City and Chicago, as well as in banks in other large cities, to facilitate interregional payments and commercial transactions. The leading correspondent banks in New York City and Chicago held substantial deposits for banks located throughout the country (indeed throughout the world). Although such balances did not satisfy *legal* reserve requirements, they were among the most liquid assets of commercial banks.

The Fed was aware of the substitutability among different categories of reserves. In considering whether to increase reserve requirements, Fed officials estimated the number of banks that likely would be unable to satisfy an increase in required reserves without selling securities or contracting their deposit liabilities. The Fed estimated that as of January 1937, only 197 member banks (out of a total of 6,367 banks) could not satisfy an increase in reserve requirements by utilizing their excess reserve balances or by decreasing their deposits with correspondents by less than 50 percent, and that their aggregate reserve deficiency would be only $123 million. Of these banks, 13 were in New York City and Chicago, and they accounted for $109 million of the aggregate $123 million estimated deficiency. Thus, Fed officials were confident that an increase in reserve requirements would not cause most banks to sell securities or reduce their lending, or have a significant impact on interest rates (Chandler, 1971, pp. 316-17). As Figure 2 shows, in the aggregate, excess reserves were still a significant fraction of bank assets even after the increases in reserve requirements in 1936 and 1937; in June and December 1937, the ratio of excess reserves to total assets for Fed member banks as a whole had fallen from pre-June 1936 levels of 5 to 7 percent to levels of 1.8 and 2.6 percent for June 1936 and December 1937, respectively. After 1937, excess reserves increased, rising to over 10 percent by 1940.

Figure 2 also shows semi-annual data on the behavior of various other measures of reserves (relative to total member bank assets). The measure required reserves/assets is the ratio of legally required reserves (using the requirements shown in Table 1) relative to total assets. The measure Res2 equals balances with the Federal Reserve (i.e., balances that meet statutory reserve requirements) plus vault cash, cash items in the process of collection, and balances due from other banks. The measure Res3 equals Res2 minus net balances due to other banks. The measures Res6 and Res7 equal Res3 and Res2, respectively, plus bank holdings of government securities. All four measures generally rose between 1934 and 1940, except between December 1936 and June 1937, when all but Res3 fell. Thus, the period encompassing the doubling of reserve requirements (shown by the vertical lines) appears to have interrupted temporarily a secular increase in reserve ratios that had begun by 1934.

Figure 3 plots semi-annual data for 1934-41 on the various measures reserves to total assets for central reserve city banks located in New York City. The data show clearly the doubling of the ratio of required reserves to assets, and also show corresponding decreases in excess reserves to total assets held by New York City banks. The total reserves of New York City banks with the Federal Reserve rose by \$643 million between June 1936 and June 1937, and their aggregate ratio of reserves at the Fed to total assets increased from 0.16 to 0.21.

Figure 3 also shows the ratios of the four broader measures of reserves to total assets. Because New York City banks lost some \$220 million of correspondent deposits between June 1936 and June 1937, the increase in the ratio Res3/assets was larger (in percentage terms) than the increase in reserve balances with the Fed to total assets.

The measures Res6 and Res7 equal Res3 and Res2, respectively, plus bank holdings of government securities. New York City banks reduced their holdings of government securities by \$1.1 billion, but *increased* their loans by \$750 million between June 1936 and June 1937. Thus, the changes in the balance sheets of New York City banks were consistent with the complaint expressed most strongly by Treasury Secretary Morgenthau that banks had responded to the increases in reserve requirements by selling government securities, which had driven up their market yields, rather than simply by having their "excess" reserve balances converted into "required" reserve balances. However, the increase in lending by New York City banks is not consistent with Friedman and Schwartz's view that banks curtailed the supply of credit to private-sector borrowers in response to the increase in reserve requirements, at least not immediately. New York central reserve city banks were a large part of the banking system; they comprised 29 percent of total member assets as of June 1936. Lending by New York City banks did fall after June 1937 but, of course, that could have reflected numerous influences, including a decline in loan demand during the recession (which began in May 1937), as well as a curtailment of the supply of base money as the result of the sterilization of gold inflows.

Because they held enormous correspondent deposits, the response of New York City banks to the increases in reserve requirements may have differed from the response of member banks elsewhere. Figure 4 plots the various reserve/assets measures for country member banks, i.e., Federal Reserve member banks throughout the country, excluding the central reserve city banks of New York and Chicago and the reserve city banks in other major cities. Country banks accounted for 29 percent of the total assets of Fed member banks in June 1936. The reserve deposits of country banks with the Fed rose 35 percent ($350 million) between June 1936 and June 1937, compared with a 31 percent increase for New York's central reserve city banks. The deposits of country banks with correspondents fell by some $200 million. However, the ratios Res2/assets and Res3/assets were essentially flat over time; they remained at the same levels in June 1937 as they had been in June 1936. Moreover, country banks increased their holdings of government securities by $350 million and their loans by $305 million, and, in contrast with New York City banks, the measures Res6/assets and Res7/assets for country banks were *higher* in June 1937 than they had been in June 1936. These patterns are not consistent with the notion that the increases in reserve requirements caused a reduction in the money multiplier for the country bank component of the banking system.

There was also substantial heterogeneity in the behavior of bank balance sheets between June 1936 and June 1937 across Federal Reserve districts. For example, Figures 5 and 6 show reserve ratios for reserve city banks located in the Boston and San Francisco districts, respectively. For Boston district reserve city banks, which comprised 3 percent of total Fed member bank assets in June 1936, the various reserves/assets measures exhibit substantial declines between June 1936 and June 1937 (especially between December 1936 and June 1937), particularly the Res2/assets and Res3/assets measures. However, the changes in the reserve/assets measures for San Francisco district reserve city banks, which accounted for 9 percent of Fed member bank assets in June 1936, are much smaller. Moreover, except for the Res6/assets measure, they all increased between June 1936 and June 1937.

The data disaggregated by class of bank and Federal Reserve district, as well as for different measures of liquid to total assets, reveal a more complex picture than is apparent from the aggregate "money multiplier" analysis of Friedman and Schwartz (1963). These regional differences are not surprising; regionally-disaggregated measures of economic activity (e.g., the number of business failures, the value of building permits, or Dun & Bradstreet's index of economic activity) also reveal substantial heterogeneity in economic conditions during the 1937-38 recession.[4] Next, we investigate how well estimates of the demand for bank reserves for various classes of banks and Fed regions based on micro data for 1934 and 1935 track actual reserves measures during 1936-38.

V. Data

The data for this study are drawn from two sources. Aggregated data for 1934 through 1941 for reserve city banks, by Federal Reserve District, for each of the twelve Fed Districts, and similar data for

[4] In regression results not reported here, we replaced Fed district indicator variables (used in Tables 4 and 5) with district-level measures of business conditions, business failures, and building permits, and found them significant in predicting reserve holdings of Fed member banks. For our simulation purposes, the district indicator variables are the more appropriate way to capture cross-sectional differences in the economic environment (as we discuss further below), but that evidence suggests that district indicators reflect district-specific macroeconomic factors.

central reserve city banks in New York City, central reserve city banks in Chicago, and non-reserve city "country" banks located throughout the United States, are all from the Federal Reserve's *Banking and Monetary Statistics, Volume 2* (1943). Bank-level data for all Fed member banks, from call reports for December 1934 and December 1935, are from microfilm records of call reports, which were hand-collected as part of the Calomiris and Mason (2003a, 2003b) data collection effort.

The Calomiris and Mason (2003a, 2003b) data set of individual Fed member bank call reports ends in 1935. We use individual bank-level data for 1934 and 1935 to estimate reserve demand and then apply the estimated coefficients from that model to 1936-1938 data for the 15 mutually exclusive aggregates of Fed member banks.

Our micro sample consists of data on 6,207 individual Federal Reserve member banks, 5,790 of which are country banks, 362 are reserve city banks, and 49 are central reserve city banks. While just over 9 percent of the sample consist of reserve city or central reserve city banks, those banks are much larger than the country banks, averaging almost $17 million in assets versus just over $1 million in assets for country banks. Reserve city and central reserve city banks represent only 9 percent of banks, but 55 percent of bank assets. The variables used in our regression analysis are defined in Table 2, and summary statistics for those variables are given in Table 3. In our analysis, we estimate separate models for country banks and for city banks (reserve city and central reserve city banks) since we find important differences in the reserve demands of these two categories of banks. Thus, in Table 3, we report summary statistics separately for those two groups. There are too few central reserve city banks to perform regression analysis separately for that group, but we include two indicator variables to capture any average differences in reserve demand for Chicago or New York City central reserve city banks.

VI. Estimation Results

Calomiris and Mason (2007) develop an empirical model of national bank reserve demand for the pre-World War I period, which shows that bank asset composition, liability mix, and bank location are significant in predicting cross-sectional variation in bank reserves relative to assets. Calomiris and Mason (2003a) develop a model of survival duration for Fed member banks during the period 1929-1933, in which measures of bank asset and liability mix and risk, as well as conditions in the local economic environment, play important roles in explaining the survival of Fed member banks during the Great Depression. Calomiris and Wilson (2004) show that the high reserve demand of banks during the Great Depression reflected the desire of banks to preserve low default risk on their deposits in the wake of large loan losses during the Depression. Banks also cut dividends during the Depression to shore up their capital ratios, but few banks raised new capital from external sources, since adverse-selection problems in the equity market implied high dilution costs on new offerings. Our model follows all three of these studies by allowing the reserve demands of Fed member banks to vary according to their location and their asset and liability mix, and conceives of cross-sectional variation in reserve demand as reflecting differences across banks in their risk, leverage and liquidity profiles.

Our goal is to model the fundamentals of reserve demand in the cross section. As of December 1935, reserve requirements likely were not binding for most banks. Referring to Equation (4), the reserve ratios of the vast majority of banks were determined by fundamental demand (the top line in the expression).[5] Table 4 reports ordinary least squares (OLS) regressions for total reserves relative to

[5] In results not reported here, we also ran regressions using excess reserve ratios as our dependent variables. Note that because required reserves only vary in the cross-section as a function of deposit mix, there will be no substantial difference between an empirical model of the cross-section that uses the ratio excess reserves to assets as the dependent variable and a similar model that uses the total reserve ratio, if the explanatory model includes measures of liability mix, as our model does. Thus, one cannot learn much about the degree to which reserve requirements are binding (as described in Equation 4) by comparing the fit of these alternative models. Nevertheless, under the assumption that reserve requirements are generally non-binding in December 1935, one

assets for various reserve concepts. We also ran an analogous set of regressions defining reserve ratios using total deposits in the denominator; the results were very similar, although adjusted R-squared is consistently higher when using assets as the scaling variable.

We consider three definitions of reserve ratios in our regressions: res2, res3, and res6. Res2 is a narrow, gross concept of reserves (which excludes Treasury securities, but includes deposits at other banks); res3 is the same as res2, but subtracts deposits due to other banks when measuring reserves, and res6 is a broad, gross measure of the reserve ratio, which adds Treasuries to the res2 measure of reserves. We ran but do not report other regression results (res1, res4, res5, and res7), which do not differ qualitatively from the results reported here, which vary in which liquid assets are included in the definition of reserves. Res1 excludes vault cash, res4 and res5 include Treasury bills but not bonds, and res7 includes all Treasuries but excludes deposits held for other banks.

The financial ratios used in the regressions to capture bank-specific characteristics obviously are endogenous variables that reflect bank choices as well as exogenous circumstances. Our models are intended to *predict* reserve demand, so that demand can be simulated for 1936-1937; we do not claim to *identify* the various exogenous structural influences on reserve demand. Our regression model can only include measures of bank characteristics in December 1934 and December 1935 that are also observed for the various member bank aggregates we analyze in 1936 and 1937. In particular, we cannot include in the regression county-level or state-level characteristics that may be relevant for reserve demand. The reason is simple: our aggregate measures do not capture shifts over time in the relative importance of counties or states within each of those aggregates.

The regression models in Table 4 are linear, which allows us to map from bank-specific data to banking aggregates. As we will discuss, we also consider weighted least squares (WLS) estimated, in

would expect the fit of the total reserve specification to be superior, and we do find consistently higher adjusted R-squared for total reserve specifications, compared to analogous specifications explaining excess reserve ratios.

addition to ordinary least squares (OLS), to permit larger banks (which inherently have greater weight in the 1936 and 1937 aggregate data) to also have greater weight when estimating the regression coefficients.

When modeling bank-specific characteristics that predict reserve demand, variables must be defined carefully to avoid "mechanical" correlations that result from the structure of balance sheets. For example, a model of reserves/assets that uses non-reserves/assets as an explanatory variable would achieve an R-squared of 1, since the two concepts are perfectly negatively correlated, but one would learn nothing from such a model. The financial ratios employed in the regressions in Table 4, therefore, are constructed to avoid such mechanical correlations.

The current and lagged (December 1934) bank characteristics included as predictors of reserve demand in Table 4 fall into three categories: a bank size indicator (the natural logarithm of total assets, **ln_ta**), to capture influences related to size after controlling for other variables, five asset composition variables that measure the riskiness and liquidity of assets, and four liability mix variables that capture the liability structure of the bank (its leverage and its deposit mix), which are relevant for capturing both default risk and liquidity risk.

Size has no significant effect within the sample of city banks (reserve city and central reserve city banks), indicating little effect of economies of scale, per se, within that group. Size enters positively in the country bank sample. Larger country banks may have experienced higher risks related either to their business strategy or their locations that are otherwise unobservable.

The construction of the five asset composition variables begins by dividing assets into cash and non-cash categories. Cash assets include vault cash, reserves at the Fed, deposits at other banks, Treasury securities, and cash items in process of collection. Non-cash assets include everything else, and mainly consist of loans and non-Treasury securities.

The mix of cash assets should matter for reserve ratios, since some categories (e.g., reserves at the Fed) are "better" as cash than others. Reserves at the Fed are more liquid than Treasury securities, are immune from interest rate risk, and can satisfy the legal reserve requirement; thus, one would expect that, ceteris paribus, banks that hold a higher proportion of Treasury securities relative to total cash assets should have to hold more reserves, when reserves are defined broadly to include Treasuries, and less reserves when reserves are defined narrowly to exclude Treasuries (since they are substitutes for vault cash and reserves at the Fed). That is precisely what the regression results show. The coefficient on **USgovsec_cashass** is negative in the res2 and res3 regressions, and positive in the res6 regressions. We also include the ratio of vault cash to total cash assets (**vaultcash_cashass**) to see whether vault cash (which did not count toward the legal reserve requirement) and which is not easily transferrable to other banks via the depository network, is less valuable as a reserve asset than reserves at the Fed or deposits at other banks (the excluded category of cash assets), and we find that it consistently enters with the expected negative sign.[6]

Loans are a relatively illiquid and risky asset compared with private bonds, and we expect **loan_noncash** to enter positively in all the regressions, which it does. The composition of loans should also matter for reserve demand. We lack detailed information about loan composition, but we are able to distinguish real estate loans from other loans. The share of real estate loans in total loans (**realestateloan_loan**) is positive and significant for country banks, but insignificant for reserve city and central reserve city banks. That result is not surprising, since these likely reflect the larger exposure of country banks to agricultural real estate lending. We also attempt to capture variation in the riskiness of real estate loans through the ratio of "other real estate owned" (which generally represents foreclosed

[6] These results have interesting implications for thinking about how to measure aggregate liquidity in the financial system. An index of aggregate liquidity that would combine reserves at the Fed, vault cash, and Treasury securities would give the greatest weight to reserves at the Fed, and less weight to the other components. Such an index could be employed as an alternative to high-powered money or M1 or M2 to measure changes in market liquidity over time, an application of these regression results that we intend to pursue in subsequent work.

real estate) relative to total real estate lending (**oreo_realestateloan**). That variable is never highly significant statistically, but given its potential relevance as a measure of risk, we include it as a predicting variable.

Liability mix is captured by measuring the proportion of debt finance and its composition. We capture leverage with net worth relative to total assets (**nw_ta)**; the higher the net worth ratio, the lower the leverage, and according to Calomiris and Wilson (2004), the lower should be the demand for reserves. As predicted, nw_ta enters with the predicted negative sign. The mix of debt should also matter; deposits entail withdrawal risk, especially demandable deposits. The ratio of total deposits relative to debt (**td_ta-nw**) should, and does, enter positively in the regressions, but more for the res2 and res3 regressions than for the res6 regressions, and more for country banks than reserve city banks. Demand deposits due to the public as a proportion of total deposits (**dd_td**), and deposits due to banks as a fraction of deposits (**dtb_td**), should, and do, enter positively in res2 and res6 regressions (although the statistical significance is higher for country banks; for res3 regressions, the sign on dtb_td is negative, as one would expect, given that deposits due to banks is subtracted from the numerator of res2 to arrive at the res3 measure.

We also include indicator variables for bank location, which capture both the distinct long-term circumstances of different banks' liquidity needs (e.g., a New York City, or a Chicago, location), as well as divergent short-term economic environmental circumstances, which are captured by the Federal Reserve District indicator variables. In regression specifications not reported here, we substituted measures of macroeconomic performance at the Fed District level (business conditions, business failures, and building permits) for the District indicator variables, and we found these measures were highly statistically significant. However, these variables also vary greatly over time, and given the cross-sectional nature of our 1935 model, for purposes of simulating fundamental reserve demand in 1936 and 1937, including these District-level environmental measures would be problematic since we are unable to capture dynamic adjustment to these macroeconomic variables from cross-sectional estimates.

In Section VII we will use estimated values from cross-sectional regressions to simulate the path of reserves for 15 mutually exclusive aggregates of Fed member banks (New York City central reserve city banks, Chicago central reserve city banks, country banks, and reserve city banks in each of the 12 Fed districts). Because we will be simulating aggregates rather than individual bank behavior, it is appropriate to use weighted least squares (WLS) estimates, which estimate coefficients by weighting banks according to their size. Specifically, we experimented with three different weighting approaches. First, we weighted banks according to their asset size relative to the total assets of member banks in their Fed district. Second, we weighted banks according to their asset size relative to the mean asset size of member banks in their Fed district. Third, we weighted banks according to the size of their deposits relative to the mean deposit size of member banks in their Fed district. The WLS estimates are quite similar in all three approaches, and none of our simulation results or conclusions differs across these three different approaches to weighting. We report the WLS results using the second weighting scheme in Table 5, and use them in the simulations, since those results exhibited slightly higher adjusted R-squareds than the other two weighting methods.

Overall, the results of the WLS results are similar to the OLS results, both for the city banks' sample and the non-city (country) banks, but the WLS and OLS results are more similar for the country banks. Several effects for city banks are larger in absolute value and more statistically significant than in the OLS specifications, including the coefficients on **vaultcash_cashass**, **loan_noncash**, **realestateloan_loan**, **dd_td**, **lag_vaultcash_cashass**, **lag_loan_noncash**, and the indicator variables **frdist_dum2** and **nycity** (which switches sign). Several effects in the WLS results for city banks are smaller in absolute value and statistical significance, including the coefficients on **nw_ta**, **td_tanw**, **lag_oreo_reloan_ratio**, and the indicator variables **frdist_dum9** and **chicagocity**. We conclude that for the sample of city banks (which includes some of the largest banks in the country, as well as much smaller banks) weighting by bank size affects the WLS results because the behavior of the largest banks differs from that of other banks. The changes in the coefficients on **nycity** and **chicagocity** are consistent with that interpretation. For example, once greater weight is given to larger banks in the sample (which tend to be located in New York City and Chicago), larger banks have more influence on estimated coefficients for financial ratios, and the changes in financial ratio coefficients eliminate the need for a special indicator variable for Chicago.

Not surprisingly, there are far fewer differences between the OLS and WLS results for the country banks sample (which is far more homogeneous in terms of the size and function of the included banks). In that sample, the absolute magnitude of lag_USgovdep_td rises, and there is an offsetting decline in the absolute value of USgovdep_td. Two other effects are also substantially reduced in the WLS results: lag_USgovsec_cashass and frdist_dum3.

VII. Simulated Reserve Demand, 1936-1937

Using the coefficients from our res3 WLS estimates in Table 5, along with data for the balance sheet ratios and location characteristics of banks for June and December calls in 1936-1938, we simulate res3 demand for the 15 mutually exclusive aggregates of Fed member banks. We report results here only for the res3 reserve measure, but the results for res2 and res6 simulations are broadly similar. We report res3 results because these should be relatively favorable to the Friedman-Schwartz hypothesis because res3 is our narrowest measure of reserves.

For each of the 15 aggregates, Figure 7 plots simulated res3 (**proj**) and actual res3 (**Res3_Ta**) on the left side of each panel, and compare the difference between them (**diff**=simulated minus actual res3) against the path of the ratio of required reserves relative to total assets (**Reqres_Ta**) on the right side of each panel. The plots show that, for the most part, proj tracks Res3_Ta well. And, more importantly, the forecast errors are not consistent with a story in which increased reserve requirements caused increases in reserve ratios that would not otherwise have happened. A model based entirely on information about reserve demand fundamentals from December 1935 would have predicted the rising demand for reserves that occurred in 1936-1938, to the extent that there were increases.

Table 6 reports the relative size of each of the 15 aggregates plotted in Figure 7. The Figure displays three sets of patterns over the key period of June 1936 to June 1937, during which the reserve requirement increases took effect, none of which is consistent with the view that reserve requirement increases caused increases in reserve ratios. In six of the 15 cases, representing 20.7% of the assets of Fed member banks, from June 1936 to June 1937 res3 ratios actually fell (for New York District reserve city banks, Boston District reserve city banks, Cleveland District reserve city banks, Chicago central reserve city banks, Chicago District reserve city banks, and Minneapolis District reserve city banks). Clearly, the declines in reserve ratios for these five aggregates are inconsistent with the Friedman-Schwartz view, since the actual change in the ratio of reserves to assets was negative. In another three of the 15 cases, representing 33.0% of member bank assets (country banks, Dallas District reserve city banks, and Kansas City District reserve city banks) the changes in actual reserve ratios were essentially zero, and in all of those cases, projected increases exceeded actual increases. In the remaining six cases, representing 46.3% of member bank assets (New York central reserve city banks, Philadelphia District reserve city banks, Richmond District reserve city banks, Atlanta District reserve city banks, St. Louis District reserve city banks, and San Francisco District reserve city banks) reserve ratios increased from June 1936 to June 1937, but in each of those cases *projected increases were always greater than actual*.

In none of the 15 cases did we observe a rise in reserve ratios coinciding with a negative residual (a case when projected increases under-forecast actual).[7]

An important point that these diverse patterns of reserve demand demonstrate is that the overall increase in aggregate reserve demand during the mid-1930s was driven by a subset of city banks. As our simulations show, country banks' reserve demands remained flat because the fundamental determinants of their reserve demands did not prompt them to increase their reserves. Indeed, Cargill and Mayer's (2006) findings that compared non-member banks to Fed member banks are better understood as a comparison between, on the one hand, smaller member and non-member country banks – which, as a group did not increase their reserve demand – and on the other hand, city banks – which as a group, increased their reserve demand. The difference between city banks and country banks reflected different fundamental influences on reserve demand and not increases in reserve requirements, which is further illustrated by the fact that the increase in city banks' reserve demands did not occur for city banks in all locations.

VIII. Conclusion

The Federal Reserve doubled reserve requirements in three stages in 1936 and 1937 in an attempt to remove "slack" from the banking system and to put itself in the position of being able to tighten the money supply through open market sales or further reserve requirement increases if deemed necessary. The Fed did not believe that the higher reserve requirements reduced the supply of money or credit in 1936 and 1937. Friedman and Schwartz (1963) challenged that view and argued that the higher reserve requirements raised reserve demand, thereby lowering the money multiplier and

[7] Note that the starting points of the actual and projected res3_ta ratios in December 1935 are not the same. This reflects the fact that in the individual bank regressions actual bank size is used, but in applying the estimated coefficients to the aggregates, we cannot observe the distribution of banks' size, and so use average bank size instead. This introduces a difference between the level of projected and actual reserves, but should not have any material effect on the differences between the two over time, which is the focus of our discussion.

contracting the supplies of money and credit. Subsequent studies have both supported and contested that view.

Ours is the first study to examine reserve demand directly at a disaggregated level to see if Fed member banks actually increased their reserve demands in response to the increases in reserve requirements. We use microeconomic data on Fed member banks from 1934 and 1935 to model reserve demand, and find that various alternative measures of demand are highly predictable as a function of bank-specific and location characteristics.

Based on the model estimated using data from the 1934 and 1935, when reserve requirements clearly were not a binding constraint on bank reserve demand, we simulate reserve demand for 1936-1938 for 15 mutually exclusive aggregates of Fed member banks (New York City central reserve city banks, Chicago central reserve city banks, reserve city banks in each of the 12 Fed Districts, and country banks located in smaller cities and towns). We find that to the extent that banks increased their reserve ratios during the period of reserve requirement increases, the increases in reserve demand between June 1936 to June 1937 reflected predictable influences related to the structure of the banks, and not increases in reserve requirements imposed by the Fed. This evidence lends support to the Fed's interpretation of the effects of the reserve requirement increases, and casts doubt on the view that the doubling of reserve requirements caused the recession of 1937-1938. Other policy actions, especially reduced monetary base growth (due to the December 1936 sterilization of gold flows) and the 1936 tax rate increases, seem more likely culprits in causing the recession.

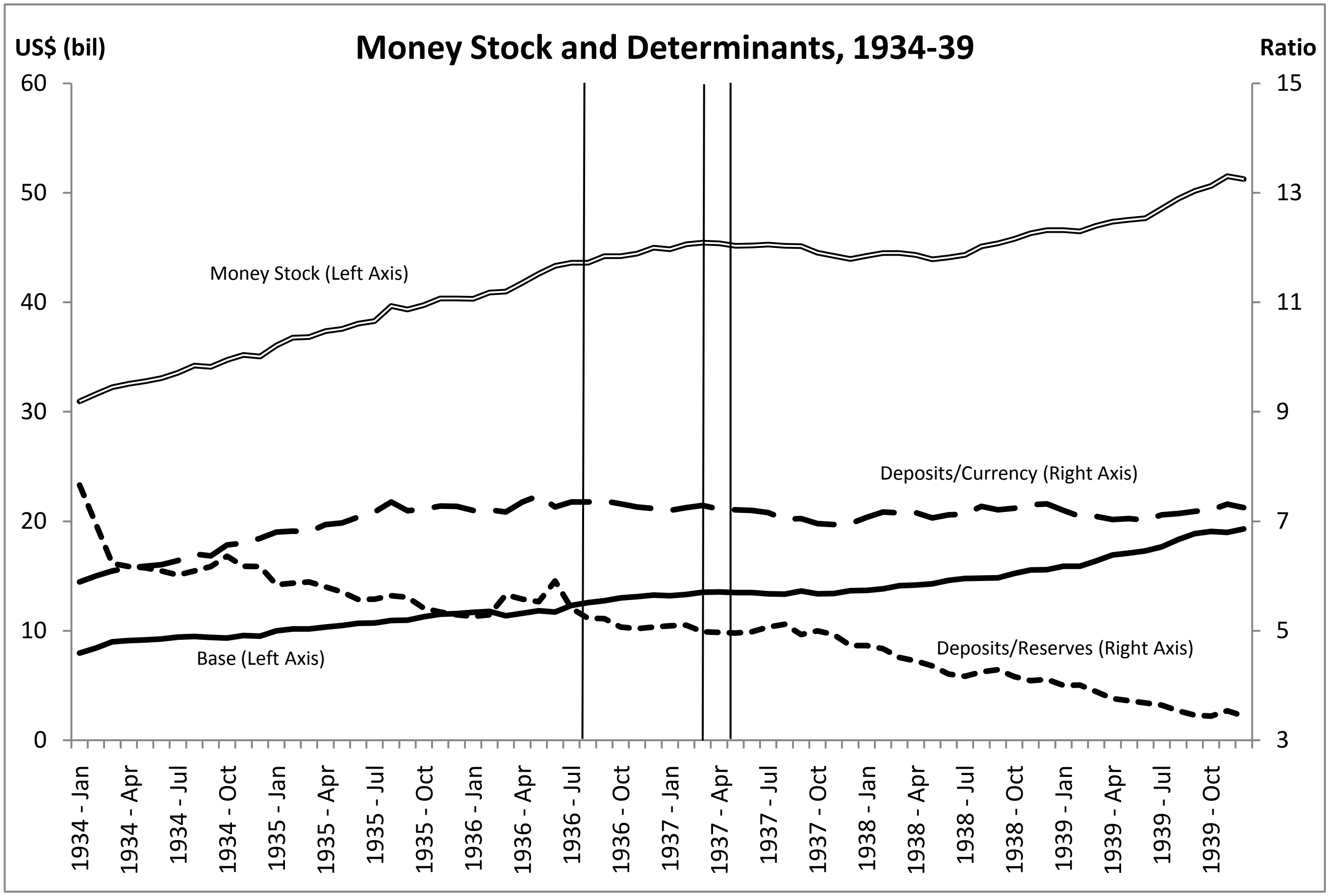
There are important lessons from the experience of the mid-1930s for monetary policy today. U.S. banks now hold huge amounts of excess reserves. Total excess reserves in the banking system total roughly a trillion dollars, and the largest four banks alone account for a quarter of that amount. As in the

1930s, these reserves are not “superfluous” balances; rather, they are held intentionally by banks as ways of stabilizing their asset portfolios, reducing their risk and improving their liquidity.

As bank profits and loan opportunities increase, and as macroeconomic risks recede, banks will reduce excess reserves to finance loan expansion. Still, the shedding of excess reserves is unlikely to be uniform across the banking system; just as in the 1930s, changes in reserve preferences likely will display substantial heterogeneity across banks. Without an understanding of the microeconomic foundations of the shifting demand for reserves, policy makers may be caught flat-footed when the demand for reserves changes. A major reduction in reserve demand for even two of the largest banks in the system could imply substantial expansion of money and credit.

Some Fed officials have advocated raising interest payments on excess reserves to prevent too rapid a contraction of excess reserves and increase in lending as reserve-demand preferences shift. That approach may work, but its efficacy is limited by the ability of the Fed to gauge the interest elasticity of reserve demand and raise interest rates accordingly. And, of course, the extent of feasible interest rate increases on reserves may be limited by the Fed’s need to maintain its own solvency. Clearly, the ability to understand and anticipate changes in reserve demand preferences will be key to the successful implementation of monetary policy in the coming years.

Figure 1


Money Stock and Determinants, 1934-39
US$ (bil)
Ratio
60
50
40
30
20
10
0
15
13
11
9
7
5
3
Money Stock (Left Axis)
Deposits/Currency (Right Axis)
Deposits/Reserves (Right Axis)
Base (Left Axis)
1934 - Jan
1934 - Apr
1934 - Jul
1934 - Oct
1935 - Jan
1935 - Apr
1935 - Jul
1935 - Oct
1936 - Jan
1936 - Apr
1936 - Jul
1936 - Oct
1937 - Jan
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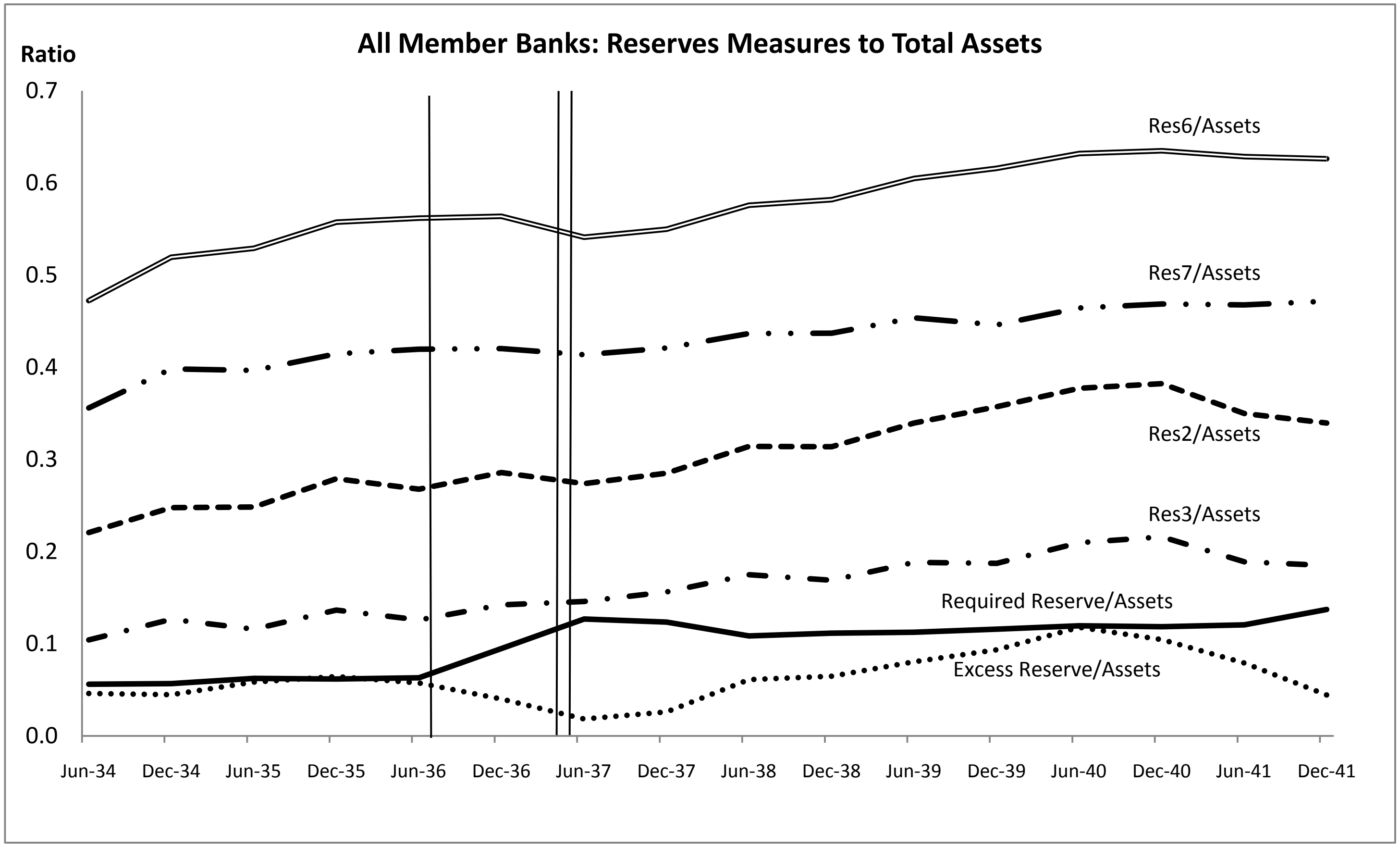
1939 - Jul
1939 - Oct

Figure 2



All Member Banks: Reserves Measures to Total Assets
Ratio
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Res6/Assets
Res7/Assets
Res2/Assets
Res3/Assets
Required Reserve/Assets
Excess Reserve/Assets
Jun-34
Dec-34
Jun-35
Dec-35
Jun-36
Dec-36
Jun-37
Dec-37
Jun-38
Dec-38
Jun-39
Dec-39
Jun-40
Dec-40
Jun-41
Dec-41

Figure 3

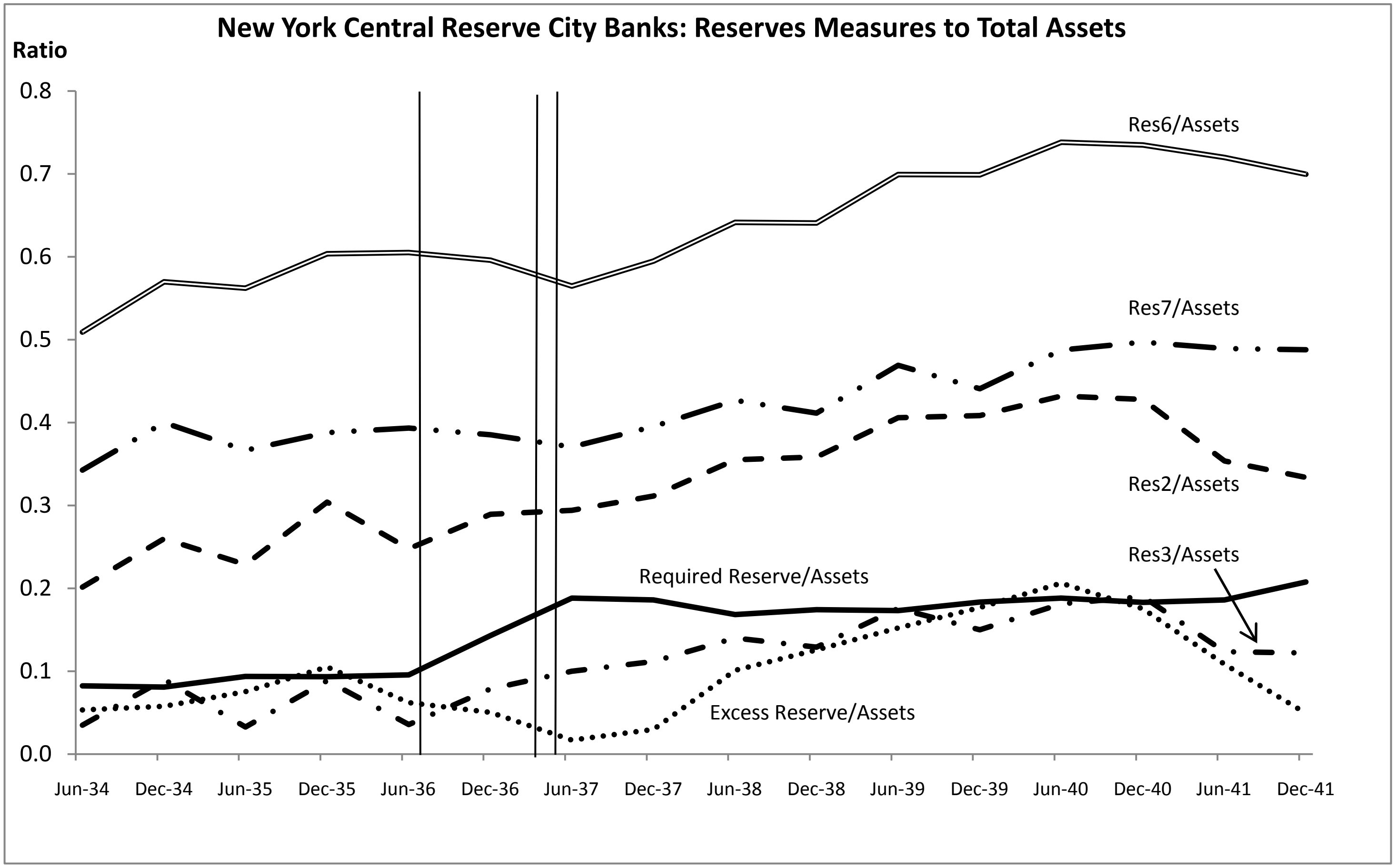

New York Central Reserve City Banks: Reserves Measures to Total Assets
Ratio
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Res6/Assets
Res7/Assets
Res2/Assets
Res3/Assets
Required Reserve/Assets
Excess Reserve/Assets
Jun-34
Dec-34
Jun-35
Dec-35
Jun-36
Dec-36
Jun-37
Dec-37
Jun-38
Dec-38
Jun-39
Dec-39
Jun-40
Dec-40
Jun-41
Dec-41

Figure 4

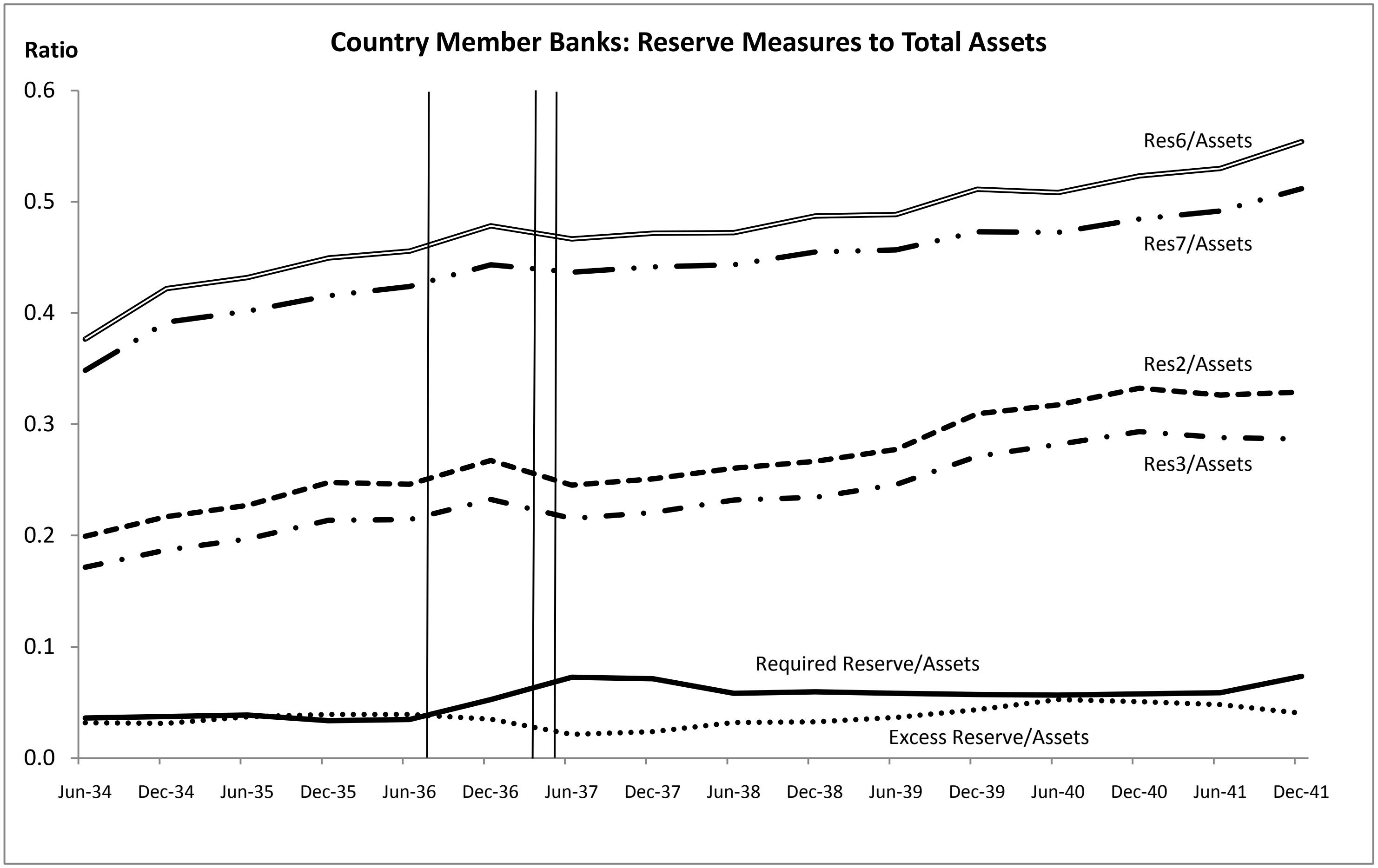
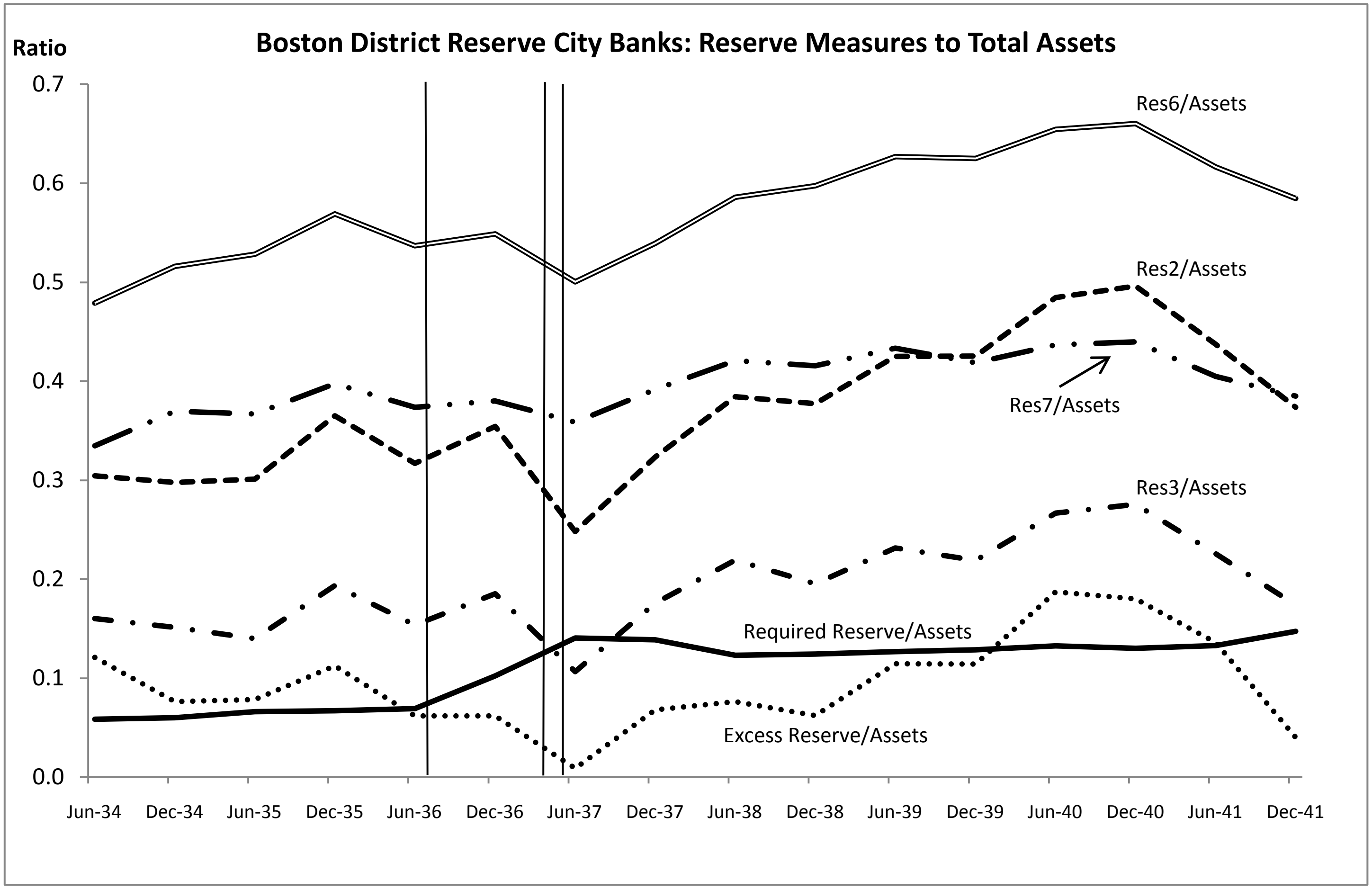

Country Member Banks: Reserve Measures to Total Assets
Ratio
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Res6/Assets
Res7/Assets
Res2/Assets
Res3/Assets
Required Reserve/Assets
Excess Reserve/Assets
Jun-34
Dec-34
Jun-35
Dec-35
Jun-36
Dec-36
Jun-37
Dec-37
Jun-38
Dec-38
Jun-39
Dec-39
Jun-40
Dec-40
Jun-41
Dec-41

Figure 5


Boston District Reserve City Banks: Reserve Measures to Total Assets
Ratio
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Res6/Assets
Res2/Assets
Res7/Assets
Res3/Assets
Required Reserve/Assets
Excess Reserve/Assets
Jun-34
Dec-34
Jun-35
Dec-35
Jun-36
Dec-36
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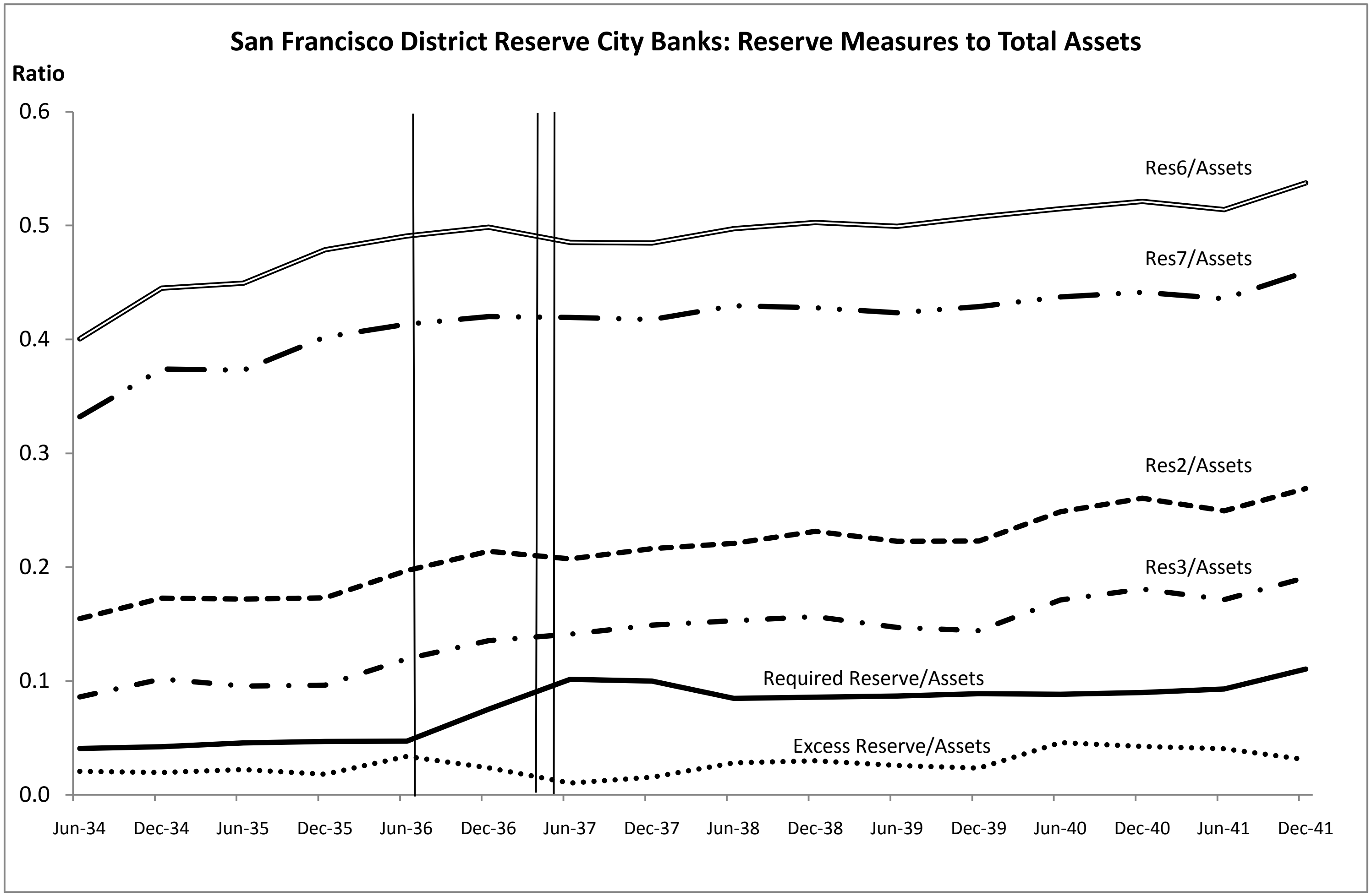
Dec-40
Jun-41
Dec-41

Figure 6


San Francisco District Reserve City Banks: Reserve Measures to Total Assets
Ratio
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Res6/Assets
Res7/Assets
Res2/Assets
Res3/Assets
Required Reserve/Assets
Excess Reserve/Assets
Jun-34
Dec-34
Jun-35
Dec-35
Jun-36
Dec-36
Jun-37
Dec-37
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Dec-38
Jun-39
Dec-39
Jun-40
Dec-40
Jun-41
Dec-41

Figure 7: Actual and Projected Reserves Measures for Various Classes of Banks

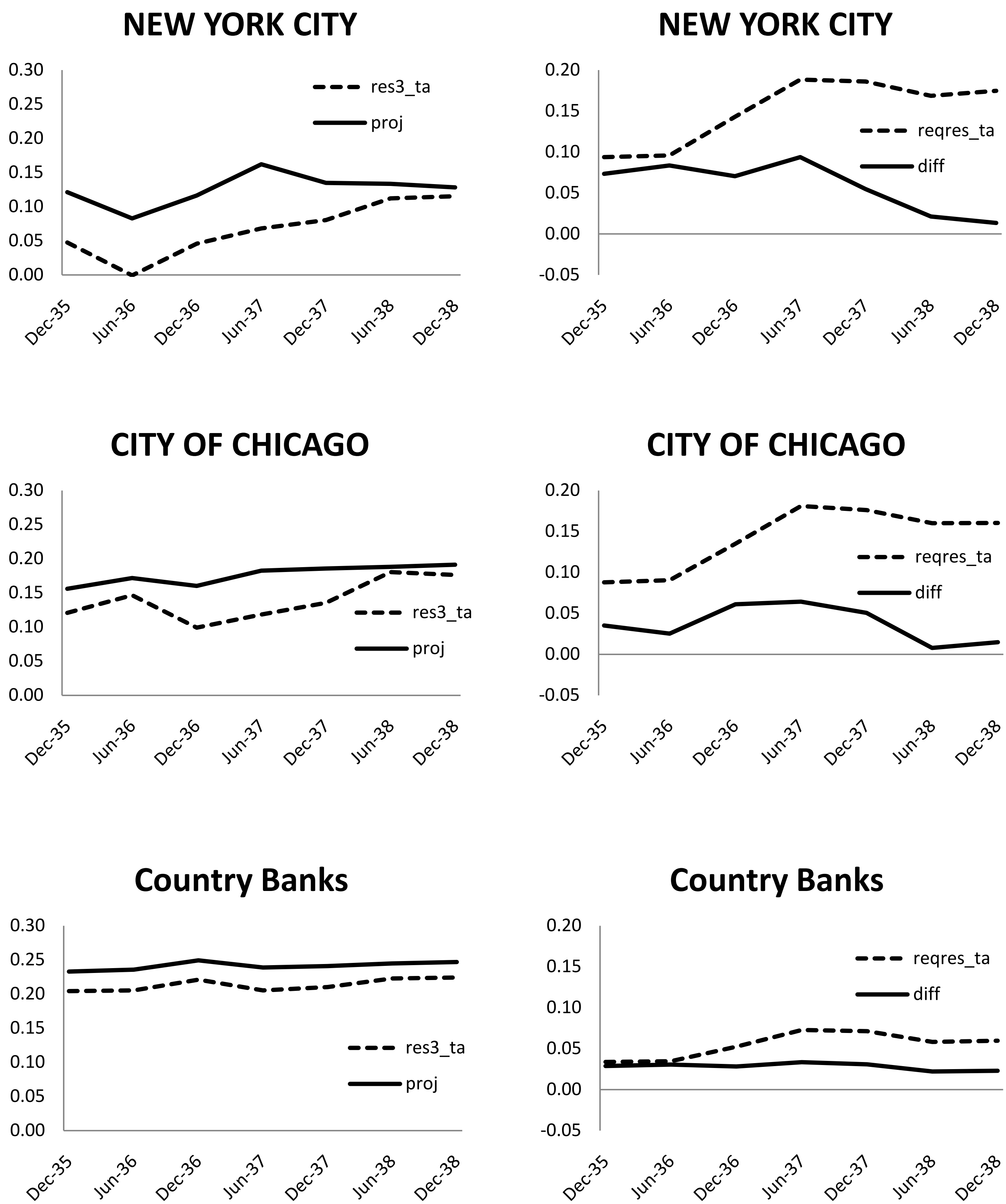

Figure 7: Actual and Projected Reserves Measures for Various Classes of Banks

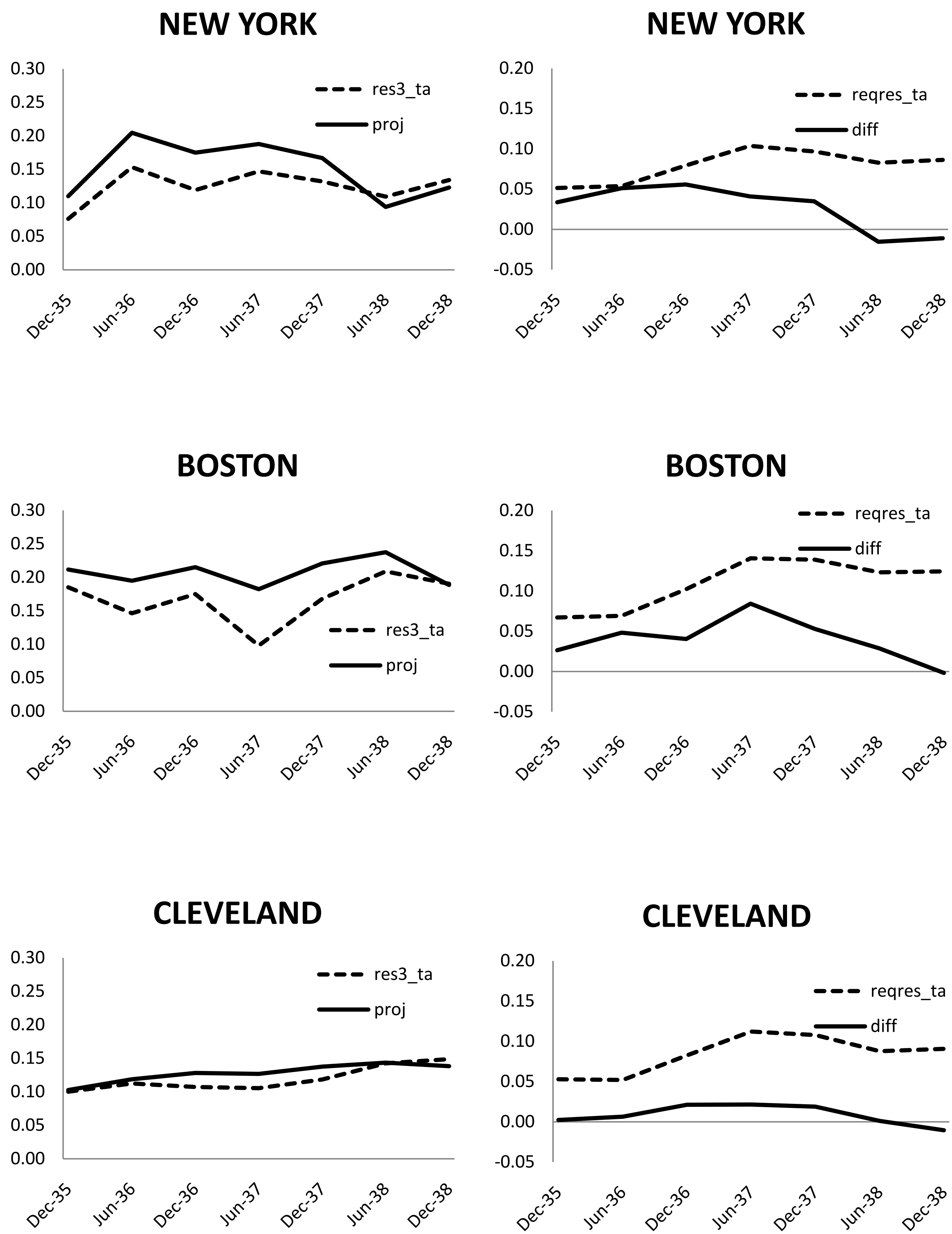

Figure 7: Actual and Projected Reserves Measures for Various Classes of Banks

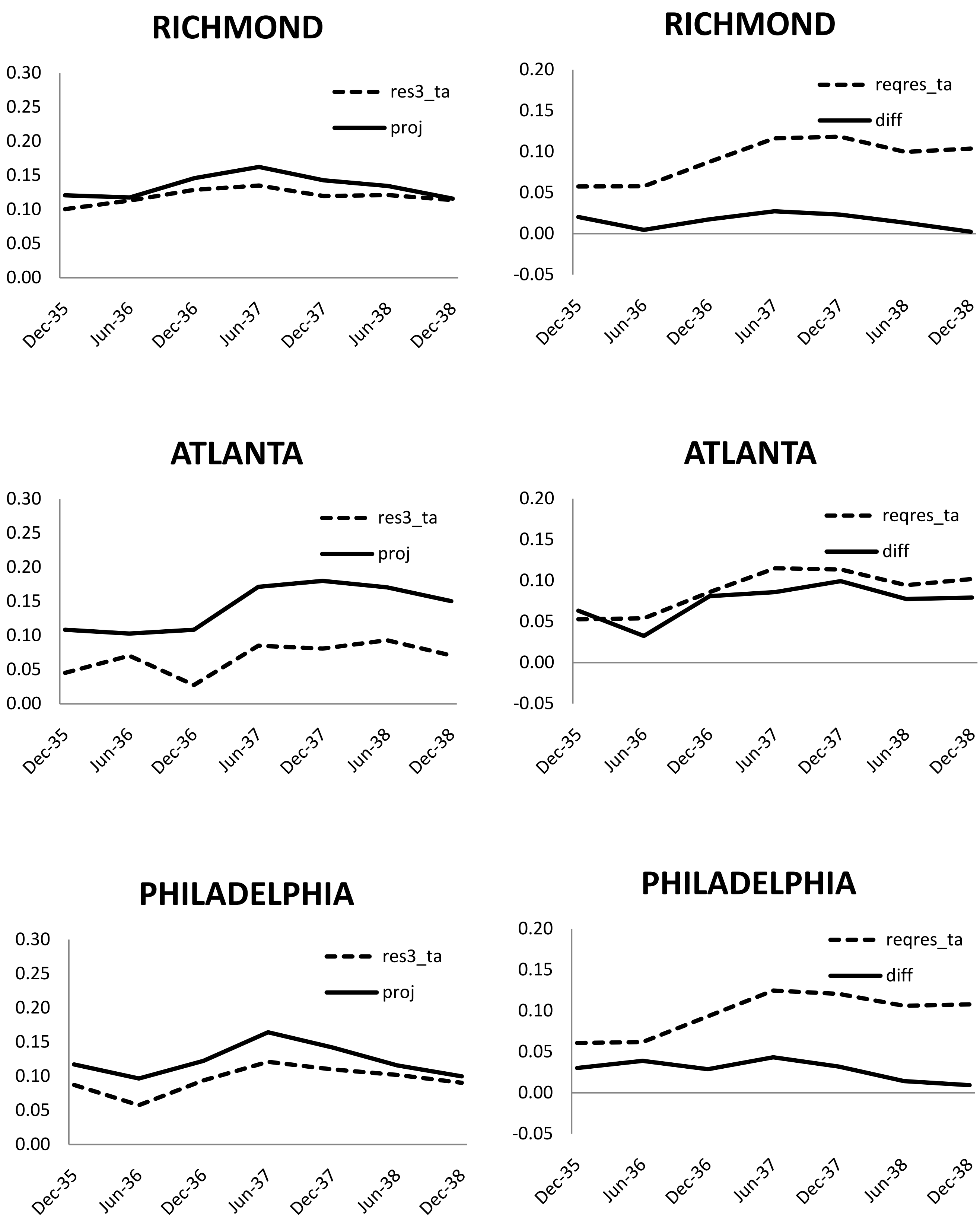

Figure 7: Actual and Projected Reserves Measures for Various Classes of Banks

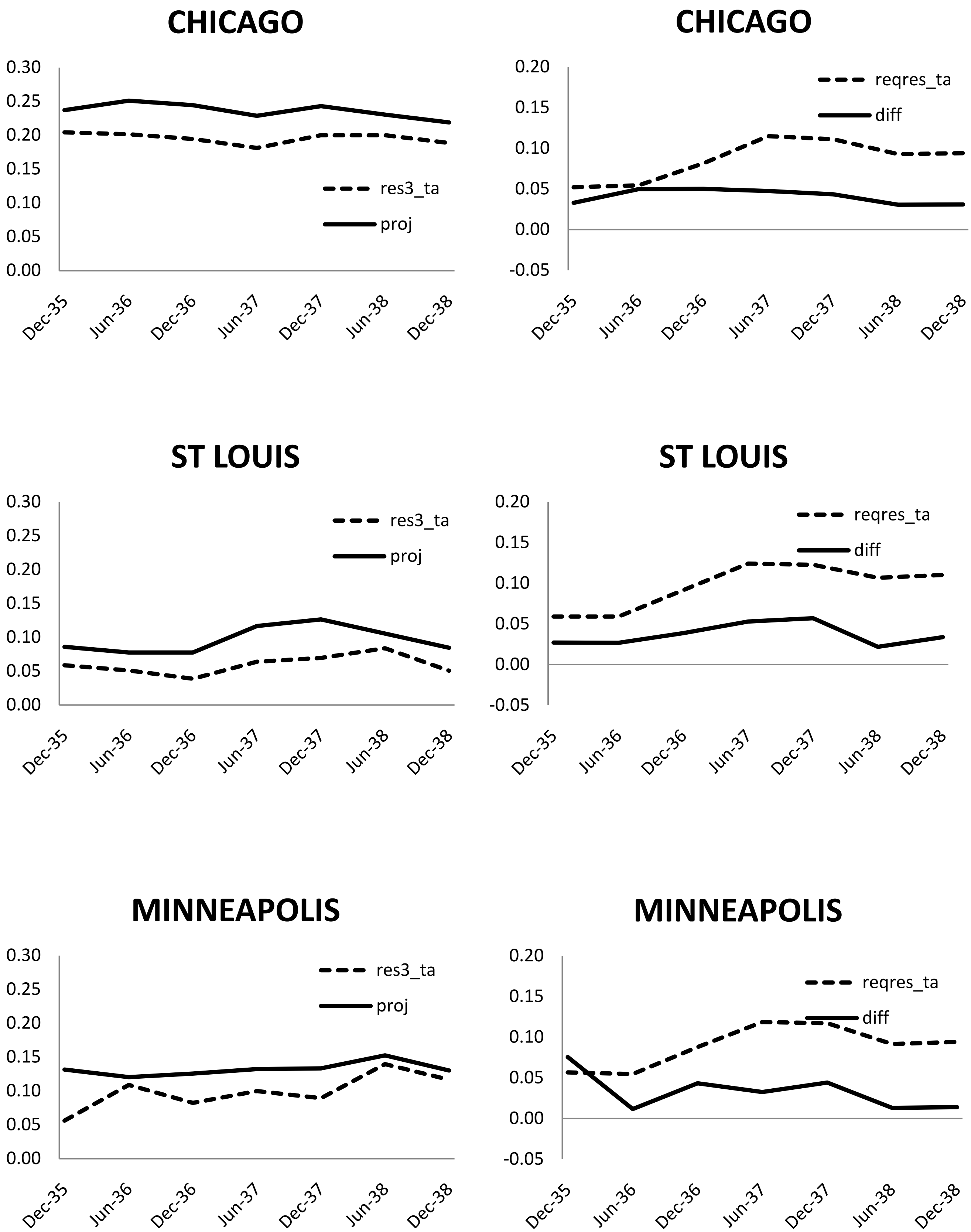

Figure 7: Actual and Projected Reserves Measures for Various Classes of Banks

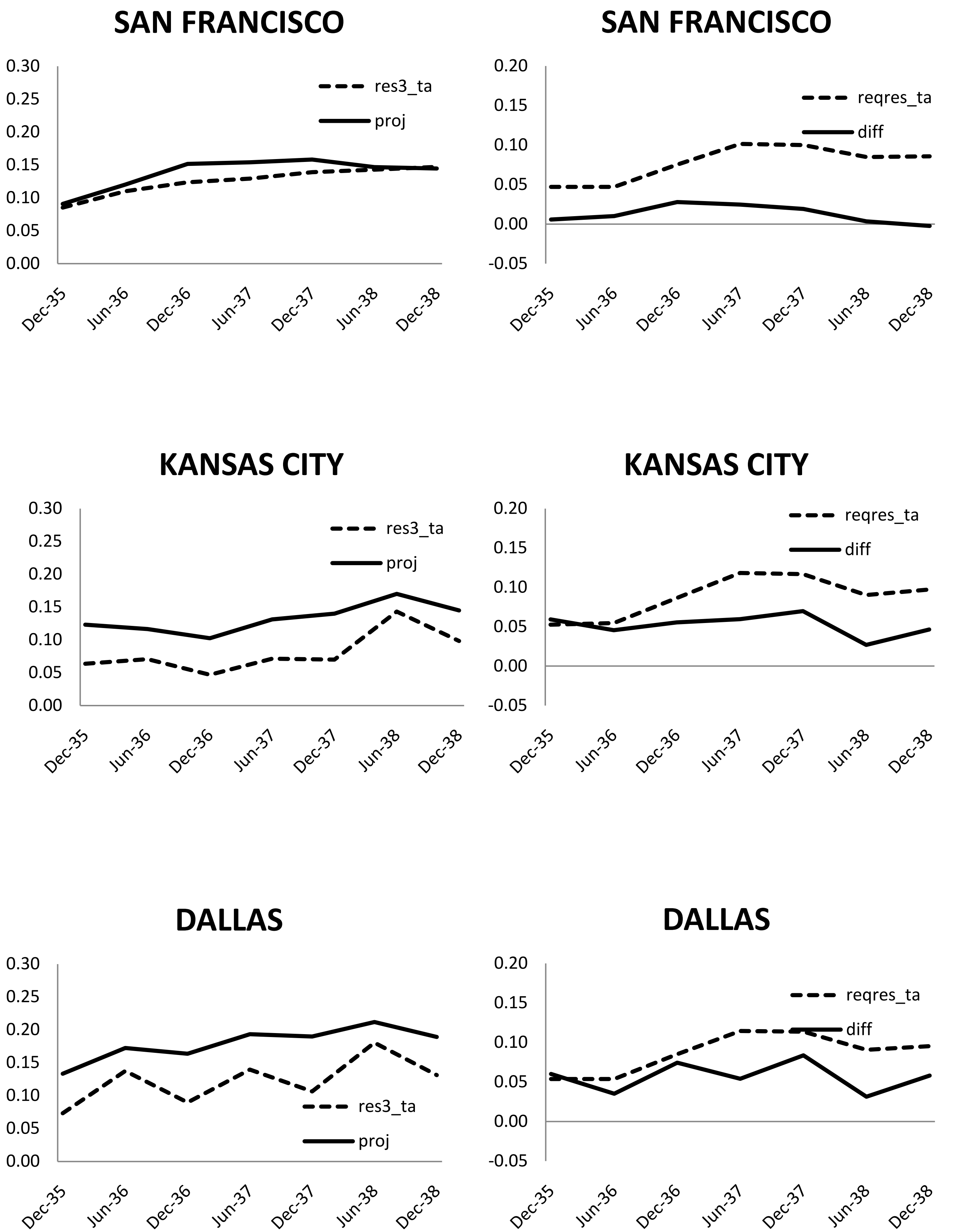

Table 1. Member Bank Reserve Requirements, June 21, 1917 - December 31, 1941

(Percent of Deposits)

Class of Deposits and Bank	June 21, 1917 - Aug. 15, 1936	Aug. 16, 1936 - Feb. 28, 1937	Mar. 1, 1937 - Apr. 30, 1937	May 1, 1937 - Apr. 15, 1938	Apr. 16, 1938 - Oct. 31, 1941	Nov. 1, 1941 - Dec. 31, 1941
On net demand deposits:						
Central reserve city	13	19.50	22.75	26.00	22.75	26.00
Reserve city	10	15.00	17.50	20.00	17.50	20.00
Country	7	10.50	12.25	14.00	12.00	14.00
On time deposits:						
All member banks	3	4.50	5.25	6.00	5.00	6.00

Source: Board of Governors of the Federal Reserve System (1943). *Banking and Monetary Statistics, 1914-41*. Washington, DC.

Table 2. Variable Definitions

Variable	Definition
res2_ta	=(total cash reserve / total asset) = (reserve with FED + Cash and Due From Banks) / total asset
res3_ta	= (net total cash reserve / total asset) = (reserve with FED + Cash and Due From Banks - Due to Banks) / total asset
res6_ta	= (reserve with FED + Cash and Due From Banks + USGovernment Securities Owned) / total asset
ln_ta	= log (Total Asset)
USgovsec_cashass	= USGovernment Securities Owned / Cash Asset[b]
vaultcash_cashass	= Vault Cash / Cash Asset
loan_noncash	= Loans and Discounts / Non-Cash Asset[c]
realestateloan_loan	= Real Estate Loan[d] / Loans and Discounts
oreo_reloan_ratio	= Real Estate Owned Other Than Banking House / Real Estate Loan
nw_ta	= Net Worth[e] / Total Asset
td_ta-nw	= Total Deposits / (Total Asset - Net Worth)
dd_td	= Demand Deposits / Total Deposits
dtb_td	= Due to Banks / Total Deposits
USgovdep_td	= US Government Deposits / Total Deposits
lag_ln_ta	= lag of **ln_ta**
lag_USgovsec_Cashass	= lag of **USgovsec_cashass**
lag_vaultcash_cashass	= lag of **vaultcash_cashass**
lag_loan_noncash	= lag of **loan_noncash**
lag_realestateloan_Loan	= lag of **realestateloan_loan**
lag_oreo_reloan_ratio	= lag of **oreo_reloan_ratio**
lag_nw_ta	= lag of **nw_ta**
lag_td_ta-nw	= lag of **td_tanw**
lag_dd_td	= lag of **dd_td**
lag_dtb_td	= lag of **Dtb_Td**
lag_USgovdep_td	= lag of **USgovdep_td**
frdist_dum2	= 1 if the bank is located in New York, 0 otherwise
frdist_dum3	= 1 if the bank is located in Philadelphia, 0 otherwise
frdist_dum4	= 1 if the bank is located in Cleveland, 0 otherwise
frdist_dum5	= 1 if the bank is located in Richmond, 0 otherwise
frdist_dum6	= 1 if the bank is located in Atlanta, 0 otherwise
frdist_dum7	= 1 if the bank is located in Chicago, 0 otherwise
frdist_dum8	= 1 if the bank is located in St. Louis, 0 otherwise
frdist_dum9	= 1 if the bank is located in Minneapolis, 0 otherwise
frdist_dum10	= 1 if the bank is located in Kansas City, 0 otherwise
frdist_dum11	= 1 if the bank is located in Dallas, 0 otherwise
frdist_dum12	= 1 if the bank is located in San Francisco, 0 otherwise
nyCity	= 1 if the bank is located in New York City
chicagocity	= 1 if the bank is located in Chicago

Table 2. Variable definitions (Cont'd)

[a] **required reserve**	= net demand deposit[f] × 0.13 + time deposit × 0.03 for central reserve city banks = net demand deposit × 0.1 + time deposit × 0.03 for reserve city banks = net demand deposit × 0.07 + time deposit × 0.03 for country banks
[b] **cash asset**	= USGovernment Securities Owned + Reserve with Fed + Cash and Due From Banks + Outside Checks and Other Cash Items
[c] **non-cash asset**	= total asset - cash asset
[d] **Real Estate Loan**	= Real Estate Loans, Mtgs, Deeds of Trust, and Other Liens on Real Estate on Farm Land + Real Estate Loans, Mtgs, Deeds of Trust, and Other Liens on Other Real Estate
[e] **Net Worth**	= Capital + Surplus + Net Undivided Profits + Reserves for Dividends or Contingencies
[f] **net demand deposit**	= Due to Banks + Demand Deposits + US Government Deposits - Due from Banks[g] - Outside Checks and Other Cash Items
[g] **Due from Banks**	= DFB and Trust Companies in New York City + Due from Member Banks and Trust Companies in Chicago for 1934 + Due from Banks and Trust Companies Elsewhere in US + Due from Non-member Banks and Trust Companies in New York for 1934 + Due from Non-member Banks and Trust Companies in Chicago for 1934 + Due from Non-member Banks and Trust Companies Elsewhere in US for 1934

Table 3. Summary Statistics

Reserve-city Banks

Variable	N	Min	Max	Med	Mean	Std
res2_ta	411	0.0341	0.7200	0.2944	0.3024	0.1156
res3_ta	411	-0.4326	0.6017	0.1560	0.1571	0.1377
res6_ta	411	0.0341	0.9082	0.5571	0.5500	0.1523
ln_ta	411	12.7070	21.5447	16.4354	16.6356	1.6120
USgovsec_cashass	411	0.0000	0.8489	0.4526	0.4385	0.1707
vaultcash_cashass	411	-1.7456	0.7974	0.1213	0.1374	0.1382
loan_noncash	411	0.0437	1.2151	0.6257	0.6113	0.1719
realestateloan_loan	411	0.0000	1.0000	0.1006	0.1738	0.1971
oreo_reloan_ratio	411	0.0000	1.0000	0.0801	0.1701	0.2322
nw_ta	411	0.0363	0.4950	0.1056	0.1180	0.0508
dd_td	411	0.0000	0.9707	0.4823	0.4876	0.1565
USgovdep_td	411	0.0000	0.3156	0.0125	0.0335	0.0487
td_tanw	411	0.3891	1.0220	0.9495	0.9305	0.0758
dtb_td	411	0.0000	0.8274	0.1341	0.1745	0.1624
lag_ln_ta	411	12.6218	21.3728	16.3112	16.5120	1.6291
lag_USgovsec_cashass	411	0.0000	0.8792	0.4606	0.4522	0.1728
lag_vaultcash_cashass	411	-1.7692	0.8007	0.1098	0.1326	0.1373
lag_loan_noncash	411	0.0057	0.9986	0.6298	0.5987	0.1729
lag_realestateloan_loan	411	0.0000	0.9999	0.0968	0.1780	0.2059
lag_oreo_reloan_ratio	411	0.0000	1.0000	0.0684	0.1429	0.1969
lag_nw_ta	411	0.0448	0.4984	0.1191	0.1303	0.0568
lag_dd_td	411	0.0000	0.9359	0.4604	0.4726	0.1576
lag_USgovdep_td	411	0.0000	0.4785	0.0367	0.0585	0.0681
lag_td_tanw	411	0.3602	1.0927	0.9295	0.9110	0.0831
lag_dtb_td	411	0.0000	0.8018	0.1241	0.1601	0.1542

Country banks

Variable	N	Min	Max	Med	Mean	Std
res2_ta	5688	0.0418	0.9414	0.2383	0.2692	0.1408
res3_ta	5688	-0.4381	0.8758	0.2152	0.2478	0.1395
res6_ta	5688	0.0604	0.9562	0.4248	0.4310	0.1599
ln_ta	5688	11.2240	18.8303	13.7038	13.8245	1.0737
USgovsec_cashass	5688	0.0000	0.8963	0.3740	0.3715	0.2079
vaultcash_cashass	5688	-2.7145	0.7371	0.0855	0.1040	0.0909
loan_noncash	5688	0.0299	1.8507	0.5715	0.5705	0.1859
realestateloan_loan	5688	0.0000	0.9366	0.1935	0.2277	0.1708
oreo_reloan_ratio	5688	0.0000	1.0000	0.0730	0.1401	0.1923
nw_ta	5688	0.0000	0.8159	0.1400	0.1517	0.0594
dd_td	5688	0.0000	1.0000	0.4467	0.4807	0.2278
USgovdep_td	5688	0.0000	0.6625	0.0020	0.0274	0.0591
td_tanw	5688	0.3284	1.0549	0.9131	0.8926	0.0848
dtb_td	5688	0.0000	0.7812	0.0104	0.0284	0.0495
lag_ln_ta	5688	10.8553	18.7885	13.6431	13.7719	1.0693
lag_USgovsec_cashass	5688	0.0000	0.9173	0.4618	0.4509	0.1857
lag_vaultcash_cashass	5688	-38.8341	0.7242	0.0798	0.0844	0.5466
lag_loan_noncash	5688	0.0305	1.1077	0.5821	0.5752	0.1836
lag_realestateloan_loan	5688	0.0000	0.9750	0.1829	0.2205	0.1694
lag_oreo_reloan_ratio	5688	0.0000	1.0000	0.0618	0.1327	0.1892
lag_nw_ta	5688	0.0000	0.7563	0.1430	0.1540	0.0591
lag_dd_td	5688	0.0000	1.0000	0.4305	0.4654	0.2302
lag_USgovdep_td	5688	0.0000	0.6939	0.0058	0.0386	0.0686
lag_td_tanw	5688	0.2790	1.0000	0.8579	0.8425	0.0924
lag_dtb_td	5688	0.0000	0.7687	0.0095	0.0268	0.0477

Table 4. OLS regressions for individual banks in December 1935

Sample	Reserve City Banks			Non-Reserve City Banks		
Dependent Variable	res2_ta	res3_ta	res6_ta	res2_ta	res3_ta	res6_ta
constant	0.2810***	0.3657***	0.2877**	0.1664***	0.1908***	0.0356
	(0.075)	(0.079)	(0.129)	(0.027)	(0.027)	(0.038)
ln_ta	-0.0097	-0.0076	-0.0356	0.0533***	0.0530***	0.0898***
	(0.043)	(0.046)	(0.064)	(0.013)	(0.013)	(0.017)
USgovsec_cashass	-0.4650***	-0.4547***	0.1602***	-0.2871***	-0.2867***	0.2153***
	(0.037)	(0.040)	(0.057)	(0.011)	(0.011)	(0.014)
vaultcash_cashass	-0.0655**	-0.0623**	-0.0833**	-0.1993***	-0.1978***	-0.2553***
	(0.027)	(0.028)	(0.041)	(0.053)	(0.053)	(0.071)
loan_noncash	-0.0297	-0.0323	0.0391	0.0694***	0.0682***	0.1294***
	(0.052)	(0.051)	(0.086)	(0.018)	(0.018)	(0.023)
realestateloan_loan	-0.0621	-0.0552	-0.1477*	0.1099***	0.1100***	0.1483***
	(0.052)	(0.051)	(0.083)	(0.020)	(0.020)	(0.030)
oreo_reloan_ratio	-0.0130	-0.0109	-0.0052	0.0113	0.0105	0.0105
	(0.023)	(0.023)	(0.036)	(0.012)	(0.012)	(0.016)
nw_ta	-0.7655***	-0.6894**	-1.3170***	-0.3685***	-0.3310***	-0.4743***
	(0.263)	(0.276)	(0.379)	(0.058)	(0.058)	(0.077)
td_tanw	0.1607*	0.0460	0.0116	0.0961***	0.0722***	0.0706**
	(0.086)	(0.090)	(0.138)	(0.024)	(0.024)	(0.033)
dd_td	0.1790	0.1761	0.1794	0.2173***	0.2192***	0.2957***
	(0.126)	(0.130)	(0.201)	(0.028)	(0.028)	(0.037)
dtb_td	0.1732	-0.6519***	0.2611	0.2130***	-0.5417***	0.2689***
	(0.151)	(0.158)	(0.240)	(0.054)	(0.054)	(0.074)
USgovdep_td	0.0833	0.0818	-0.0251	-0.0982***	-0.0996***	-0.1230***
	(0.153)	(0.167)	(0.253)	(0.031)	(0.031)	(0.043)
lag_ln_ta	0.0074	0.0058	0.0345	-0.0484***	-0.0482***	-0.0813***
	(0.043)	(0.046)	(0.064)	(0.013)	(0.013)	(0.017)
lag_USgovsec_cashass	0.1224***	0.1109***	0.2108***	-0.0398***	-0.0399***	-0.0231
	(0.038)	(0.039)	(0.063)	(0.010)	(0.010)	(0.014)
lag_vaultcash_cashass	0.0006	-0.0023	0.0072	-0.0001	-0.0002	0.0002
	(0.026)	(0.026)	(0.039)	(0.001)	(0.001)	(0.001)
lag_loan_noncash	0.0286	0.0299	-0.0302	-0.0557***	-0.0557***	-0.1058***
	(0.052)	(0.052)	(0.086)	(0.018)	(0.018)	(0.023)
lag_realestateloan_loan	0.0735	0.0651	0.0802	-0.0827***	-0.0827***	-0.1222***
	(0.049)	(0.049)	(0.074)	(0.020)	(0.020)	(0.030)
lag_oreo_reloan_ratio	0.0402*	0.0470*	0.0527	-0.0153	-0.0152	-0.0196
	(0.024)	(0.025)	(0.040)	(0.011)	(0.011)	(0.015)

Table 4. OLS regressions for individual banks in December 1935 (Cont'd)

Sample	Reserve City Banks			Non-Reserve City Banks		
Dependent Variable	res2_ta	res3_ta	res6_ta	res2_ta	res3_ta	res6_ta
lag_nw_ta	0.2004	0.1932	0.4958	0.0685	0.0663	0.0390
	(0.243)	(0.253)	(0.352)	(0.053)	(0.053)	(0.071)
lag_td_tanw	-0.0467	-0.0428	-0.0158	-0.0217	-0.0255	0.0050
	(0.082)	(0.083)	(0.133)	(0.023)	(0.023)	(0.031)
lag_dd_td	0.0165	0.0332	0.0617	0.0075	0.0066	0.0349
	(0.124)	(0.128)	(0.195)	(0.028)	(0.028)	(0.037)
lag_dtb_td	0.0562	0.0291	0.0485	-0.0354	-0.0424	0.0341
	(0.149)	(0.154)	(0.231)	(0.052)	(0.053)	(0.075)
lag_USgovdep_td	-0.0458	-0.0339	-0.1216	0.0404	0.0412	0.0607
	(0.127)	(0.141)	(0.198)	(0.028)	(0.028)	(0.040)
frdist_dum2	-0.0247	-0.0307	-0.0706*	0.0076*	0.0055	0.0029
	(0.027)	(0.029)	(0.039)	(0.004)	(0.005)	(0.007)
frdist_dum3	0.0045	0.0050	-0.0017	-0.0096**	-0.0125***	-0.0298***
	(0.023)	(0.024)	(0.034)	(0.005)	(0.005)	(0.007)
frdist_dum4	0.0237	0.0239	0.0349	0.0179***	0.0152***	0.0367***
	(0.024)	(0.025)	(0.036)	(0.005)	(0.005)	(0.008)
frdist_dum5	0.0330	0.0312	0.0679*	0.0247***	0.0216***	0.0389***
	(0.026)	(0.026)	(0.037)	(0.006)	(0.006)	(0.008)
frdist_dum6	0.0261	0.0308	0.0550	0.0793***	0.0755***	0.1224***
	(0.027)	(0.027)	(0.037)	(0.008)	(0.008)	(0.010)
frdist_dum7	0.0598**	0.0606**	0.1140***	0.0380***	0.0352***	0.0758***
	(0.025)	(0.026)	(0.037)	(0.006)	(0.006)	(0.009)
frdist_dum8	0.0112	0.0097	0.0077	0.0307***	0.0268***	0.0527***
	(0.024)	(0.025)	(0.036)	(0.007)	(0.007)	(0.010)
frdist_dum9	0.0854**	0.0939**	0.1109**	0.0352***	0.0317***	0.0616***
	(0.036)	(0.037)	(0.052)	(0.007)	(0.007)	(0.010)
frdist_dum10	0.0574**	0.0545**	0.0900***	0.0621***	0.0589***	0.0888***
	(0.024)	(0.025)	(0.035)	(0.008)	(0.008)	(0.011)
frdist_dum11	0.0616**	0.0615**	0.1196***	0.0522***	0.0483***	0.0711***
	(0.024)	(0.025)	(0.035)	(0.009)	(0.009)	(0.011)
frdist_dum12	0.0264	0.0281	0.0207	0.0303***	0.0279***	0.0502***
	(0.026)	(0.027)	(0.038)	(0.007)	(0.007)	(0.010)
nycity	0.0228	0.0178	0.0429			
	(0.025)	(0.026)	(0.035)			
chicagocity	0.0486*	0.0409	0.1290***			
	(0.027)	(0.028)	(0.038)			
N	411	411	411	5688	5688	5688
adj. R-sq	0.683	0.769	0.517	0.659	0.653	0.481

Table 5. WLS regressions for individual banks in December 1935

Sample	Reserve City Banks			Non-Reserve City Banks		
Dependent Variable	res2_ta	res3_ta	res6_ta	res2_ta	res3_ta	res6_ta
constant	0.2734***	0.4326***	0.0961	0.2603***	0.3256***	0.1697**
	(0.069)	(0.077)	(0.119)	(0.045)	(0.050)	(0.074)
ln_ta	0.0278	0.0261	0.0308	0.0622***	0.0531***	0.0990***
	(0.042)	(0.044)	(0.066)	(0.015)	(0.017)	(0.026)
USgovsec_cashass	-0.5599***	-0.5597***	0.1113**	-0.3291***	-0.3328***	0.1865***
	(0.038)	(0.042)	(0.055)	(0.015)	(0.016)	(0.024)
vaultcash_cashass	-0.2054***	-0.2004**	-0.3112***	-0.2949***	-0.3034***	-0.4174***
	(0.077)	(0.079)	(0.113)	(0.040)	(0.041)	(0.059)
loan_noncash	0.0639	0.0527	0.2192***	0.0835***	0.0811***	0.1527***
	(0.055)	(0.051)	(0.081)	(0.023)	(0.026)	(0.037)
realestateloan_loan	-0.1125*	-0.1183**	-0.2344***	0.0929***	0.0888***	0.1346***
	(0.059)	(0.059)	(0.090)	(0.023)	(0.024)	(0.043)
oreo_reloan_ratio	-0.0090	-0.0060	-0.0083	0.0018	-0.0039	-0.0046
	(0.015)	(0.016)	(0.030)	(0.017)	(0.017)	(0.028)
nw_ta	-0.3603	-0.2576	-0.8955**	-0.3983***	-0.3458***	-0.6541***
	(0.251)	(0.233)	(0.363)	(0.075)	(0.076)	(0.144)
td_tanw	0.0628	-0.1296	-0.1058	0.0125	-0.0579	-0.0319
	(0.094)	(0.096)	(0.154)	(0.031)	(0.040)	(0.050)
dd_td	0.2202*	0.2492*	0.2437	0.1655***	0.1596***	0.2499***
	(0.131)	(0.131)	(0.225)	(0.042)	(0.042)	(0.065)
dtb_td	0.0684	-0.7348***	0.0510	0.2490***	-0.5952***	0.4425***
	(0.163)	(0.169)	(0.282)	(0.068)	(0.077)	(0.113)
USgovdep_td	-0.0429	-0.0080	-0.2158	0.0105	0.0022	0.0639
	(0.151)	(0.158)	(0.293)	(0.040)	(0.040)	(0.072)
lag_ln_ta	-0.0232	-0.0215	-0.0212	-0.0560***	-0.0459***	-0.0887***
	(0.042)	(0.044)	(0.066)	(0.015)	(0.017)	(0.026)
lag_USgovsec_cashass	0.1514***	0.1432***	0.3016***	-0.0137	-0.0140	0.0155
	(0.039)	(0.042)	(0.063)	(0.015)	(0.015)	(0.026)
lag_vaultcash_cashass	0.0228	0.0219	0.0110	-0.0005	-0.0007	-0.0009
	(0.015)	(0.016)	(0.024)	(0.001)	(0.001)	(0.001)
lag_loan_noncash	-0.0719	-0.0681	-0.2329***	-0.0773***	-0.0788***	-0.1471***
	(0.052)	(0.049)	(0.083)	(0.025)	(0.028)	(0.040)
lag_realestateloan_loan	0.0743	0.0688	0.0981	-0.1133***	-0.1133***	-0.1885***
	(0.054)	(0.055)	(0.084)	(0.023)	(0.024)	(0.044)
lag_oreo_reloan_ratio	0.0096	0.0087	0.0127	-0.0110	-0.0080	-0.0240
	(0.018)	(0.018)	(0.031)	(0.016)	(0.015)	(0.026)

Table 5. WLS Regressions for Individual Banks in December 1935 (Cont'd)

Sample	Reserve City Banks			Non-Reserve City Banks		
Dependent Variable	res2_ta	res3_ta	res6_ta	res2_ta	res3_ta	res6_ta
lag_nw_ta	-0.1740	-0.1167	-0.0782	0.0047	0.0036	-0.0255
	(0.239)	(0.221)	(0.349)	(0.071)	(0.073)	(0.125)
lag_td_tanw	0.0230	0.0381	0.1490	0.0001	-0.0147	0.0173
	(0.081)	(0.077)	(0.137)	(0.031)	(0.033)	(0.052)
lag_dd_td	0.0062	-0.0191	0.1295	0.0314	0.0368	0.0772
	(0.126)	(0.124)	(0.216)	(0.039)	(0.040)	(0.062)
lag_dtb_td	0.0892	0.0234	0.2266	-0.0316	0.0031	-0.0681
	(0.165)	(0.171)	(0.281)	(0.070)	(0.085)	(0.121)
lag_USgovdep_td	-0.0229	-0.0436	0.0198	-0.0800**	-0.0815**	-0.1474**
	(0.127)	(0.135)	(0.219)	(0.039)	(0.039)	(0.066)
frdist_dum2	-0.0330	-0.0415*	-0.1119***	0.0067	0.0070	0.0009
	(0.026)	(0.024)	(0.042)	(0.007)	(0.007)	(0.012)
frdist_dum3	-0.0207	-0.0213	-0.0347	0.0060	0.0028	-0.0023
	(0.022)	(0.022)	(0.037)	(0.006)	(0.006)	(0.011)
frdist_dum4	0.0091	0.0069	0.0358	0.0210***	0.0198***	0.0391***
	(0.022)	(0.021)	(0.039)	(0.006)	(0.006)	(0.010)
frdist_dum5	0.0253	0.0225	0.0753**	0.0292***	0.0275***	0.0432***
	(0.023)	(0.023)	(0.038)	(0.007)	(0.007)	(0.013)
frdist_dum6	0.0262	0.0272	0.0534	0.0565***	0.0540***	0.1017***
	(0.023)	(0.024)	(0.040)	(0.009)	(0.009)	(0.014)
frdist_dum7	0.0524***	0.0533***	0.1008***	0.0407***	0.0390***	0.0840***
	(0.020)	(0.020)	(0.037)	(0.007)	(0.007)	(0.013)
frdist_dum8	0.0002	-0.0052	-0.0045	0.0298***	0.0214**	0.0445***
	(0.021)	(0.021)	(0.039)	(0.008)	(0.010)	(0.012)
frdist_dum9	-0.0103	-0.0041	-0.0409	0.0465***	0.0435***	0.0739***
	(0.026)	(0.026)	(0.049)	(0.010)	(0.010)	(0.016)
frdist_dum10	0.0394*	0.0338	0.0534	0.0611***	0.0584***	0.0767***
	(0.023)	(0.022)	(0.040)	(0.009)	(0.010)	(0.014)
frdist_dum11	0.0385*	0.0401*	0.0813*	0.0572***	0.0545***	0.0675***
	(0.023)	(0.023)	(0.041)	(0.011)	(0.010)	(0.016)
frdist_dum12	-0.0265	-0.0246	-0.0722*	0.0318***	0.0310***	0.0487***
	(0.022)	(0.021)	(0.039)	(0.009)	(0.009)	(0.013)
nycity	-0.0286	-0.0293	-0.0703**			
	(0.019)	(0.019)	(0.035)			
chicagocity	0.0131	0.0127	0.0315			
	(0.023)	(0.023)	(0.041)			
N	411	411	411	5688	5688	5688
adj. R-sq	0.810	0.862	0.708	0.718	0.696	0.573

Table 6. Relative Size of Fifteen Districts

Regional district	total asset	relative size
Country Member Banks	13389	0.2878
Dallas reserve district	757	0.0163
San Francisco reserve district	4028	0.0866
Minneapolis reserve district	515	0.0111
Kansas City reserve district	1201	0.0258
Chicago reserve district	1698	0.0365
St. Louis reserve district	926	0.0199
Richmond reserve district	894	0.0192
Atlanta reserve district	808	0.0174
Philadelphia reserve district	1563	0.0336
Cleveland reserve district	2516	0.0541
Boston reserve district	1319	0.0284
New York reserve district	424	0.0091
Chicago central reserve city	3162	0.0680
New York central reserve city	13324	0.2864
sum	46524	1

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